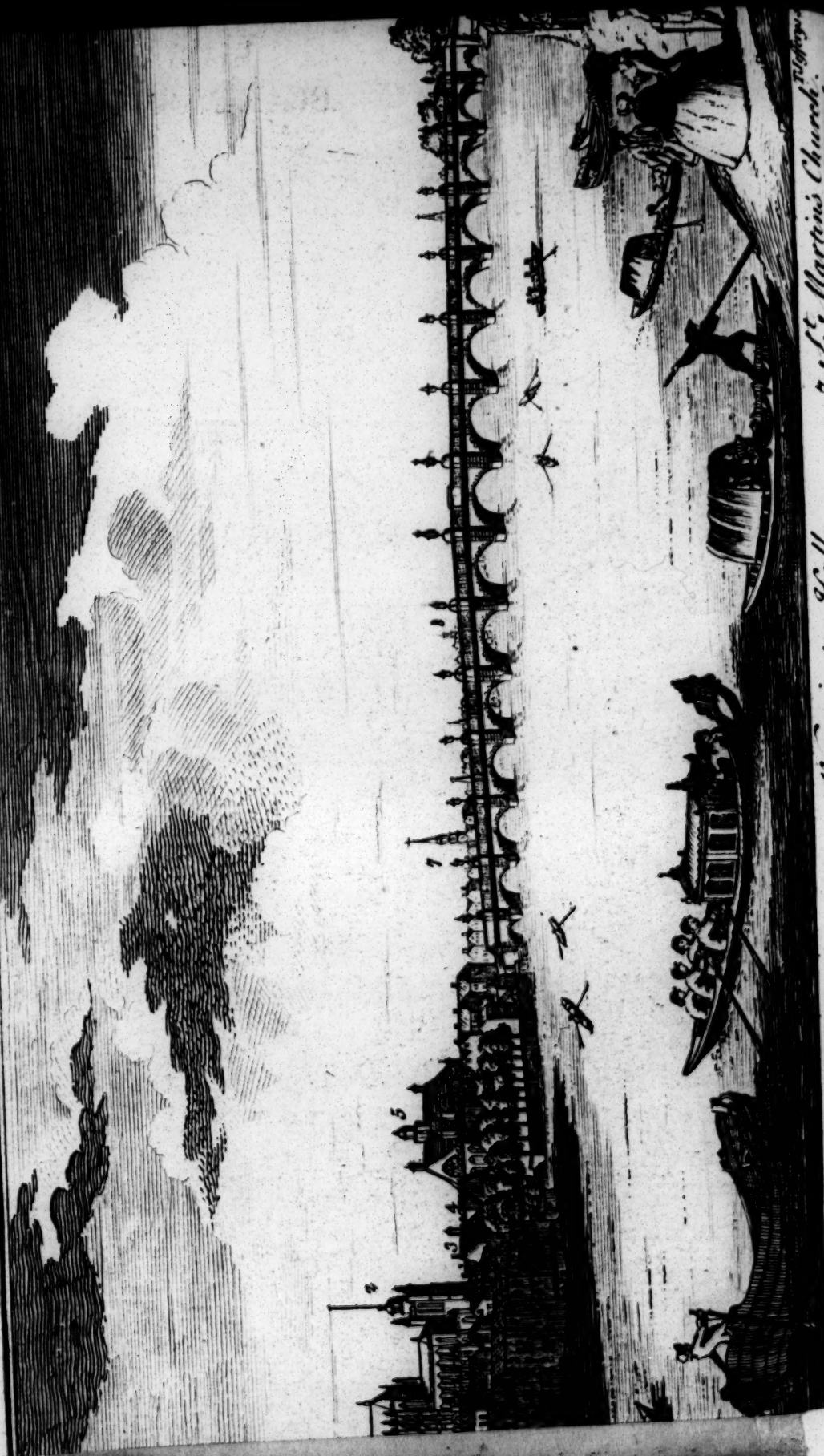


A SOUTH VIEW of WESTMINSTER BRIDGE.



3. House of Lords.

5. Westminster Hall.

7. St. Martin's Church.

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A N

3

HISTORICAL ACCOUNT

O F

B R I D G E S,

Antient and Modern,

From the most early Mention of them
by Authors, down to the present Time.

INCLUDING

A more particular History and Description of
the New Bridge at Westminster.

A N D

An Abstract of the Rules of Bridge-Building,
by the most eminent ARCHITECTS.

W I T H

Remarks, comparative and critical, deduced
both from the History and the Rules, and applied
to the Construction of Westminster-bridge.

To which is added, by way of Appendix,
An Abridgment of all the Laws relating thereto.

Bid the BROAD ARCH the dang'rous flood contain,
The *Mole* projected break the roaring Main;
Back to his bounds their subject sea command,
And roll obedient *Rivers* thro' the land:
These honours peace to happy *Britain* brings,
These are *Imperial Works*, and worthy *Kings*. POPE.

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HISTORICAL RECORD

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Ancient and Modern

From the first only Mention of them

by Authors down to the present time

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the new Bridge at Westminster

An Abstract of the Rules of Bridges
by the most celebrated Masters

Remarks, comparative and critical, deduced
both from the History and the Rules

to the Construction of every kind of Bridge
To which is added a new and improved

An Abridgement of all the Laws relating to Bridges

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A N

A N
HISTORICAL ACCOUNT
O F
B R I D G E S,
ANTIENT and MODERN.

OF all the inventions of human wit, there is scarce any one, of which the necessity and use is more obvious, than that of erecting, or throwing bridges over strearas, which would not otherwise be passable with safety. We have reason therefore to suppose, that men had very early some constructions or contrivances of this nature : and yet we do not find among the monuments of the most
B distant

distant antiquity, any memorial of such constructions.

THE Egyptians, who are generally acknowledged to be the fathers of the arts and sciences, had not, that we know of, any bridge worthy of notice, in their populous and fertile kingdom. The Nile, which traverses that country from south to north, is perhaps too large and rapid to admit of the erecting of such a structure over it, even in its most calm and temperate state : but the annual swellings of that river, which come down with such violence from the mountains of Ethiopia, as to overflow the whole low country, would, doubtless, have washed away any such building, though erected with all the strength and solidity that are almost peculiar to the edifices of that nation. Add to this, that the bed of the river, and all the soil for some miles on either side, are such a deep slime, mud, or mould, that it would have been difficult, to have laid a proper foundation to sustain the weight of a great number of heavy Arches extending from shore to shore. This is more particularly true with regard to the Lower Egypt : and if it be demon-

demonstrable, as many are of opinion, that the soil of that country is continually rising, by means of the mud, which the Nile annually leaves behind it, the highest bridge that could have been erected in the first ages of the Egyptian grandeur, must long before this time have been choaked up and buried, if it had even been able to resist the impetuosity of the current.

THE children of Israel, who at their departure out of Egypt, were conducted thro' the Red Sea by a miracle, and by another of the same nature through the river Jordan, in order to take possession of the Promised Land, had not certainly any occasion for bridges in that expedition ; and as they had scarce any other river, in all their country, but the Jordan only, they seem to have had but little knowledge, either of the structure or use of such artificial means of passage. The arts, indeed, were in general but very low among the Jews ; and though they did not always go to the Philistines to have their goads and plow-shares pointed, it is probable they knew little more of workmanship in wood, stone, or metal, than what was just necessary for the common

operations of husbandry, war, and providing against the inclemency of the weather. A bridge might be laid over the brook Kidron, the largest stream near Jerusalem, with a single plank, and by any ordinary carpenter. And what their knowledge of the world about them was, we may guess from the name of SEA given to the little lake of Tiberias, which is surpassed by many in Switzerland, and even in Scotland and Ireland. Their name for the Euphrates, tho' not at any vast distance from them, was the GREAT RIVER, as if it had been emphatically so, in comparison with all others, as well as with their own Jordan. Need we wonder, after considering the Jews in this light, that we do not meet with the description, or even the name of a bridge in all the books of the sacred scripture?

As the first empire of the world is ascribed to the Assyrians and Babylonians, so we must also allow them the honour of building the first bridge that is recorded in history. Herodotus and Curtius give this honour particularly to Nitocris, a queen who reign'd in Babylon after Semiramis ; and the judicious Mr Rollin, who had consulted both
 them,

them, and all the other antients who mention that work, gives us this account of it in his description of Babylon. “ The bridge, “ says he, was not inferior to any of the “ other buildings in beauty or magnificence : it was a furlong in length, and “ thirty foot in breadth, built with wonderful art, to supply the defect of a foundation in the bottom of the river, which “ was all sandy. The arches were made “ of hugh stones, fastened together with “ chains of iron and melted lead. Before “ they begun to build the bridge, they “ turned the course of the river, and laid “ its channel dry, having another view in “ so doing, besides that of laying the foundations more commodiously. And as “ every thing was prepared before-hand, “ both the bridge and the keys were built “ while the other project was in execution.” — We must just mention here, that this project was to secure the adjacent country from the inundations of the Euphrates, by making high artificial banks, cemented with bitumen, to the river, and also two canals to drain off a part of its water at pleasure.

WHAT

WHAT idea can we have of the famous Colossus at Rhodes, except that it was a bridge of peculiar construction? Is it reconcileable to reason, does any other extraordinary instance of art render it probable, that a statue of brass, according to our present idea of a statue, should stride a-cross the mouth of a port, and be of such immense proportions that a large ship of those days could sail in, with her masts standing, and sails spread, betwixt his legs? The project of cutting mount Atho into the figure of Alexander (as it was proposed to that prince) with such magnitude that he should hold a town in one of his hands, seems less extravagant than the design would have been of forming and erecting such a brazen statue. But if we suppose a large and lofty bridge or arch to be turned a-cross the mouth of the haven, and covered all over with thick plates of brass; and that the building was carried up on the top of this arch, to something like the figure of a man, and all plated over in the same manner; may we not then, in some measure, account for this WONDER, which, as it is now represented to us, must pass for the most incredible

dible of all the SEVEN ? At least, I would hope this conjecture may stand as fair a chance in the present sceptical age, as any other that has been advanced.

THE bridge of boats, which Xerxes laid a-cross the Hellespont, and over which he passed the most numerous army that history has ever recorded, in his expedition against the Greeks, is delivered down to us with such an air of truth, and the probability of it is so well supported by the modern military and other floating bridges, that, I think, we have no right, at this day, to call in question the credit of the historians who have described it.

As the rivers in Proper Greece, and the countries which the Greeks possessed in Asia Minor and Italy, were in general small, it is not strange that we read so little of the Grecian excellence in bridge-building, tho' their skill in other branches of architecture has been so justly and largely celebrated. The same reason will hold good with respect to the Romans, while their empire was yet in its infancy, and confined to the middle part of Italy ; the Tiber, so celebrated

ted by their historians and poets, appearing at present to be but a small stream, considerable only in regard to the city that stands on its banks. What the bridges were which the Romans afterwards built in remote provinces, when the success of their arms encouraged them to extend their conquests on every side, will be mentioned in its proper place.

AMONG all these lights from antient history, I do not find any that guide us into the knowledge of the most antient and primitive bridges, which were doubtless the most simple. But these, we may suppose, were improved before letters were invented, and therefore the description of them is not to be expected. However, as it happens, no such description is wanted in the present age, since the intercourse we have had with the native Americans seems fully to supply this defect. The men of all countries are much the same, and so are the arts they make use of, while in a mere state of nature ; allowing only for the difference of climates and countries, and the diversity of wants thence arising. Why may we not then depend on the accounts that have lately

ly been given us by the French and Spanish mathematicians, who went into Peru to measure a degree of the meridian under the æquinoctial line, of the bridges now used by the native Peruvians; why may we not, I say, depend on them for an idea of the primitive bridges in Asia and Europe, where men had at first no more art than they now have in the remotest parts of Peru? The passage that follows, was first publish'd in English in that most useful monthly collection, the Gentleman's Magazine for July 1749. It may serve as a matter of curiosity in this place, to those who have not that collection by them; as well as to furnish conjectures to illustrate the lives of the patriarchs of all nations, upon the dispersion of the sons of Noah.

“ WHERE the rivers are unfordable, says
 “ our author, the Peruvians lay bridges in
 “ the most convenient places; and of these
 “ they have three sorts. Some, though ve-
 “ ry few of them, are of stone; others of
 “ wood, which are the most common; and
 “ some are of bejucos.* For the wooden
 C “ ones

* The Bejucos are a kind of wooden cords; there are two sorts, of which one shoots out of the ground, and

“ ones they chuse the narrowest parts of
 “ the river, where it is confined by rocks,
 “ and having laid over it four huge beams,
 “ they form a bridge about a yard and a half

and grows up twining about the trees; the other is produced by the very branches of some trees, which have that peculiar property. Both these continue growing till they touch the ground, where they spread and get another body, which sprouts up again as high as its highest shoots, and then returns towards the earth, making many such repullulations; and often they are stretched in the air, betwixt two trees, as if a rope had been designedly fastened to them. They are so tough and pliant, as never to break with bending, or twisting, or even tying them into any hard knot. They grow to a huge thickness, if not cut: the smallest are about four or five lines diameter, the middle ones six or eight; as for the larger, they are unserviceable, being too stiff and bulky. They are used to make ropes and lines of all sorts, and they stand water a long time. In some places they are their only materials for building their huts.

Mr. Condamine, who was one of the French associates in this expedition, says, that he passed several rivers on these bridges of rope; that they are made of the bark of trees, or of a kind of osier, called *Lores*; that being interwoven into net-work, they form a sort of galley in the air, hanging on two cables of the same substance, whose ends are fastened on each bank to branches of trees; that the meshes of the net-work being large, lest the foot should slip through, rods and boughs are laid on the floor, so that it looks like an arbour reversed. — He adds, that these bridges being heavy, and thirty fathoms long, when the passenger is in the midst, they swag and swing in a terrible manner, especially if the wind be high; and yet the Indians, who are otherwise not very courageous, run over them with burdens, and laugh at the hesitation of a stranger.

“ broad

“ broad, sufficient for the passage of a man
 “ and a horse or mule : they traffic over
 “ these bridges with much danger, both to
 “ their lives and commodities. Those of
 “ bejucos they use where the river is so broad
 “ that no beams can reach from one side
 “ to the other. These are made by twist-
 “ ing, or wreathing several bejucos toge-
 “ ther into cables of a suitable bigness, six
 “ of which are stretched across the river,
 “ two somewhat higher than the other
 “ four : they fix a-cross them pieces of
 “ wood, and cover them with boughs, to
 “ make a floor ; from the out sides of which,
 “ to the two upper cables, pass smaller be-
 “ juco ropes to serve as rails, or banisters,
 “ for the traveller’s security : and, indeed,
 “ this is a necessary precaution ; for the con-
 “ tinual swinging of these bridges, when one
 “ is passing over them, would otherwise
 “ make it exceeding difficult to keep ones
 “ feet. This sort of bridges is chiefly for
 “ men ; the mules swim over, being unload-
 “ ed, and led near half a league above the
 “ bridge, that they may reach the opposite
 “ side near it (the current bearing strongly
 “ down) whilst the Indians cross the bridge
 “ with the loading and furniture on their
 “ shoulders,

" shoulders. The bridges of this make, over
 " some rivers of Peru, are, however, so wide
 " and strong, that droves of mules pass safely
 " over them; as the Apurimac, over which
 " is carried on all the trade and commerce
 " of Peru, betwixt Lima, Cuzco, la Plata,
 " and other southern provinces,

" AT the river Alchipichi, and others,
 " instead of a bridge of bejucos, they use
 " the tarabita; by means of which, not
 " only men and loads, but beasts also are
 " ferry'd over: for there is no such thing as
 " their swimming over, it is so extremely
 " rapid.

" THE tarabita is a rope of bejucos, or
 " thongs of baca's hide, twisted or spliced
 " together, about six or eight inches thick,
 " laid a-cross the river, and strongly secured
 " on both sides, in an inclined direction, to
 " posts, one of which is a kind of capstain,
 " or screw, for better working the con-
 " trivance. On the cable hangs a budget,
 " or hammock, of the baca's hide, large
 " enough for a man to lie down in: it is
 " suspended by a hook at each end, by
 " which it slides along the cable: from
 " each

“ each shore there is a rope fastened to each
 “ hook, to pull the hammock to the side
 “ required; the passenger gets into it, and
 “ thrusting it from the shore, he swiftly
 “ glides over to the other side.

“ In ferrying over beasts, they use two
 “ tarabitas, one to each side of the river;
 “ and the rope is much thicker, and more
 “ inclined, and has but one hook, which
 “ is of wood, to which the beast being hung
 “ by girts a-cross his belly, and from his
 “ chest to his buttocks; one thrust sets him
 “ going with such a velocity, that he is
 “ soon over. The beasts which are used to
 “ this kind of suspension-ferry, are so far
 “ from being unruly, that they offer them-
 “ selves to be tied; but the novices are very
 “ troublesome, and kick and fling, especi-
 “ ally when they are shoved off, and see
 “ themselves thus hurried down through
 “ the air. The tarabita of the Alchipichi
 “ is in length thirty or forty fathoms, or
 “ from seventy to ninety yards; and twenty
 “ to twenty-five fathoms, or from forty
 “ to fifty yards, above the water, is the
 “ greatest height, which, at first, must be
 “ a sight full of horror.”

UPON

UPON this extract we will only observe; that tho' stone bridges are mentioned at the beginning of it, there is not afterwards any description of such structures; which, if they are actually found in that rude part of Peru, we ought doubtless to consider them rather as Spanish improvements, than as the work of the untutored Peruvians themselves. Without supposing them capable of turning an arch with stone, we discover a great deal of natural ingenuity in the contrivances already described. These contrivances, indeed, rise much beyond the idea which Mons. Gautier, in his Treatise on bridges, gives us of the bridges of uncivilized nations.

“MANKIND, says this writer, have invented so many different sorts of bridges for their commerce, communication, safety, and conquests, that nothing seems to have been forgot in that respect. In the beginning, and even in these times, among the most savage people, where arts and sciences are unknown and uncultivated, they content themselves with cutting down trees on the sides of those rivulets they purpose to pass, and laying them a-cross, they cover them with fascines and turf, which serve them to

go over with safety ; but when they meet with a considerable river, they are forc'd to have recourse to their canoes, instead of a bridge, in case they cannot ford it ; or to make floats with pieces of timber, rushes, &c. tied together : in fine, all manner of means, whether more or less convenient for crossing rivers, they put in practice, in imitation of bridges."

THIS French writer, in the beginning of his work, just mentions the advantages that bridges are of to commerce. These are indeed so many, and so obvious, that as it would require much room to enumerate them, so it is almost a needless task. Much less is it necessary to remark, that bridges are of use to transport armies over unfordable rivers. But all the French, ever since Lewis XIV was in his youth, have had their heads so fill'd with conquests (except only during the ten first years of the present century) that all other thoughts must give way to those which respect the glory of their monarchy. Accordingly Gautier, having condescended slightly to mention commerce, presents us with the following paragraph in the true taste of his country.

" IF

“ If the Romans, says this writer, antiently subdued people beyond the greatest rivers that terminated their empire, it was only by constructing bridges to pass over them. And in our times, princes could not conquer their enemies, by carrying their victorious arms beyond the confines of their dominions, without making bridges to cross those vast rivers that are between them, and which oppose their conquests.”—What follows, indeed, is entirely to the purpose of this dissertation.

“ Of all the bridges that have ever existed, if we may believe history, that which Trajan built over the Danube was the greatest and the most beautiful. The river upon which it was constructed being extremely broad, it necessarily required a very long bridge to pass over it. It consisted of twenty arches, 150 feet high; and the aperture, or span of each arch, from one pier to another, was 160 feet, or about twenty-five fathoms; so that this bridge was about 600 fathoms in length, or 546 Parisian fathoms; for the antient Roman foot is eleven inches of the Parisian

Parisian foot *. The dimensions of such an immense work might astonish modern architects, if they were in fact as they are represented. When this bridge was finished, the Romans crossed the Danube, in order to conquer the Barbarians. Adrian, who succeeded Trajan, caused it afterwards to be demolished, that he might prevent the same vanquished nations from taking the advantage thereof, to cross the river, and carry their arms even into the Roman empire †. What a short duration had this stupendous instance of human art and magnificence!

THE piers of this bridge are still to be seen in the middle of the Danube: it was built between Servia and Moldavia, a little above Nicopoli.

* The Parisian foot is two thirds of an inch more than the London foot; or, they are to each other in this proportion.

London foot 1000	} parts
Paris foot 1068	

It will be no difficult matter for the curious to compute the exact dimensions of this prodigious bridge. I will only observe here, that it seems to be the single description of a bridge, that excels, in the essential parts of such a structure, what may with justice be said of the new bridge at Westminster.

† The inscription on this stately bridge is preserv'd in these words:

Providentiâ Augusti vere Pontificis Virtus Romana quid non domet? Sub jugo ecce rapidus & Danubius.

D

THEY

THEY reckon likewise, among the celebrated bridges recorded in history, that which Darius built on the Bosphorus of Thrace; that of Xerxes on the Hellespont, already mentioned; that of Pyrrhus, projected on the Adriatic gulph; that of Caligula at Baia near Puteoli; and, in fine, the military bridge which Cæsar threw over the Rhine.

THE Romans had also very fine bridges a-cross the Tiber. The emperor Adrian built the first, viz. the Ælian bridge, now called St. Angelo's, the finest at present in Rome: it was named the Ælian bridge after the emperor Adrian, whose surname was Ælius; because he caused it to be built near his Mausoleum, now the castle of St. Angelo. In process of time it was called St. Angelo's bridge, on account, as they pretend, of an angel being seen at the entrance of this bridge. It was adorned a-top with a covering of bronze, supported by forty columns.

THE second was the Triumphal bridge, now demolished, whereof the ruins are still

to

to be seen in the Tiber. Over this bridge the Roman emperors and consuls passed in triumph, at which time it was adorned with the richest ornaments that art could invent; bestrewed with flowers, and perfumes were not spared: the people were regaled with all sorts of liquors and meats; the Roman ladies particularly had the greatest share in these diversions, as being mothers or wives of the conquerors. Music and harmony enlivened the procession, mixed with various pleasures, while captive kings, loaded with chains, and tied to triumphal chariots, were dragged along.

THE third was the Janicular bridge, now called Sixtus's, by reason that pope Sixtus the IVth caused it to be rebuilt, Anno 1475. Antiently it was all of marble.

THE fourth was the Cestian bridge, now called St. Bartholomew's, rebuilt in the time of Valentinian the emperor. On a marble stone of this bridge is written the inscription below *,

D 2

THE

* *Domini Nostri Imper. Casares Fl. Valentinus, Pius, Foelix, Max. Victor. ac Triumph. semper Aug. Pont. Max.*

Germanic.

THE fifth was the Fabrician, or Tarpeian bridge, and now called Ponte Caspi, or di las quatro Capas.

THE sixth was the Senatorian, or Palatine bridge, now called di Santa Maria.

THE seventh was the Horatian bridge, antiently called the Sublician, one of the finest in Rome, and of which the ruins still remain in the Tiber ; for it has not been rebuilt in modern ages. According to the plan which an Italian author has given of this bridge, in his tracts concerning the Roman Antiquities, it rather seems to resemble a portico, or triumphal arch, than a bridge. It was several times rebuilt by the antient Romans. The first erection of it was by king Ancus Martius of wood and iron, with draw-bridges for the passing and re-

Germanic. Max. Alamann. Max. Franc. Max. Gothic. Max. Trib. Pont. VII. Imp. VI. Conf. II. P. P. &c.

Fl. Valens, Pius, Fælix, Max. Victor, ac Triumph. semper Aug. Trib. Pont. Max.

Germanic. Max. Alamann. Max. Franc. Max. Gothic. Max. Trib. Pont. III. Imp. II. Conf. prim. P. P. P.

Pontem Fælicis Nominis Gratiani in usum Senatus, ac Populi Rom. constitut. dedicarique jusserunt.

passing

passing of boats. Afterwards it was built of stone, in the time of Horatius Cocles : then rebuilt by Æmilius Lepidus the pretor, and some time after, by the emperor Tiberius. It was again demolished in the reign of the emperor Otho : and finally, it was rebuilt by Antoninus Pius.

THE eighth, and last, is without Rome, and two miles beyond it, called the Milvian bridge, on the Flaminian way. The modern name of this bridge is Ponte Mola. It remained entire till within a very few years past, when, in the last war, upon the retreat of the Austrian army from the borders of the kingdom of Naples, it was broken down to stop the pursuit of the Spaniards under count Gages.

BESIDES these very antient Roman bridges, there are more modern ones of considerable note. In France we may reckon those of Avignon, St. Esprit, and Lyons, all upon the Rhone. The first is demolished, and has nothing remaining but some few arches on the side of Avignon. The second is still entire, and may justly be said to be one of the finest bridges in the world.

WHAT

10 WHAT is in general remarkable in these three bridges, is, that their plane does not stand in a right line; especially, in those of Avignon and St. Esprit. The angle which points up the stream is hardly sensible in that of Lyons; but, as to the other two, it is evident that they make an angle, or a kind of curvature, whose convexity opposes the current of the waters of the Rhone; as if, by this curving and projecting disposition, the work could the better resist the pressure and current of the waters. The following account of these three bridges, says M. Gautier, may be relied on as true.

THE bridge of Avignon consisted of eighteen arches, being 1340 feet in length, which is about 223 fathoms. It was begun in 1176, and finished in 1188. The schism of Benedict XIII. and Boniface IX. proved fatal to this bridge; for the former, who held his see at Avignon, caused some arches of the bridge to be pulled down for his security, in 1385. The inhabitants of Avignon, in 1410, to free themselves from the Catalan garrison which Benedict XIII kept there, by means of a mine, blew up the tower which defended the head of the bridge.

THE

THE greatest misfortune that happened to it was in 1602, when, through the neglect of repairing an arch that was fallen down, three others were attended with the same fate. In fine, in 1670, the cold was so violent, that the Rhone was frozen for several weeks together, so as to bear the heaviest carriages : a sudden thaw afterwards ensuing, mountains of ice were driven against the piers, by which accident some of them were born down.

THE bridge of St Esprit is infinitely finer, and more stately, than those of Lyons and Avignon. It is built of stone, and consists of nineteen great arches, exclusive of seven small ones. It has arches from fifteen to eighteen fathoms * diameter, which makes it four hundred fathoms in length.

GREAT care is taken to keep this bridge in good repair, with stones cut for the purpose, and joined with iron cramps : with these the cavities, occasion'd in the piers by the continual washing of the waters, are fill-

* Fathoms here stand for toises of six Paris feet each ; so that the whole length of this bridge, as well as the span of the largest arches, greatly exceeds those at Westminster.

ed up whenever they happen ; by which precaution, the work is always kept secure.

THE king has established a duty of a certain number of deniers * on each measure of salt, called a minot †, that is brought up the Rhone to Lyons for exportation, which brings in a yearly revenue of six or eight thousand livres, and is appropriated to the keeping of this bridge in good repair. Thus far the French author.

THE following account of the bridge of St Esprit, according to Dr Robinson, is extracted from our own Philosophical Transactions.

“ THIS famous Roman bridge, says he, is very crooked, bending in several places, and forming many unequal angles, especially where the stream is strongest ; in which place the angle is the most unequal, and greatest : the arches are very wide, and have their feet or piers, secured by two

* Denier is the French penny, and is about a thirteenth part of the English penny.

† Minot is a measure of capacity, eleven inches nine lines high, and fourteen inches eight lines in diameter.

pedestals,

pedestals, that encompass them ; both these pedestals have their degrees of projection, or juttings out, like so many rows of stairs or steps ; the lowermost order projecting most, the others less by degrees. The second or uppermost pedestal is much less than the first or lowermost, being built a little within its lines of circumference.* Between the great arches there are windows, or as it were, small arches, that reach down to the very plane of the second, or uppermost pedestal, dividing the feet of the great arches.

FROM this description it appears, that the Romans have here contrived all possible ways gradually to break the mighty force of the Rhone, and to render its passage easy and inoffensive to the feet of the great arches ; for here are several palisadoes and sluices, sufficient to defend this wonderful fabrick from the rudest attacks of the torrent. The several rows of stairs projecting from the pedestals, which are for the most part of a triangular form, and well faced with

* These pedestals, as the doctor calls them, seem intended to answer the same purpose as the sterlings at London Bridge.

free-stone, oppose and break the stream severally, and not at once, on account of their unequal juttings ; and in case the flood should swell so high, which it frequently does, as to cover both the pedestals, then the small arches, which divide the feet of the great ones, help to convey the water through, which otherwise might endanger the great arches."

" DR. LISTER adds the following remark ; viz. That what seems the foot of the arch, is an horizontal arch gradually contracted, every stone being of a vast length, and wedge-like, and laid level with the water."

THE bridge at Rouen is a great curiosity. It is about 260 yards long, paved with stone like a street, and rises and falls with the tide, or as the land-waters swell the river. Carriages with the greatest burdens pass over it with safety, the boats being very firm, and well moored with strong chains : but it is now grown old, and requires a great deal of money to keep it in repair.

THE bridge of Lyons on the Rhone has twenty arches, but is far less worthy of notice than that last mention'd.

WITH regard to both these bridges, which are now remaining, it is likewise remarkable, that they are guarded with watch-towers to defend their passage against an enemy.

THEY also reckon in France, the royal bridge of the Thuilleries at Paris, and that of Toulouse, on the Garonne, to be very fine bridges. The latter has very wide arches, and thin piers, which occasion the less obstruction to the passage of the water: but there are other bridges in Paris, besides that of the Thuilleries, which deserve a more particular description.

WE will speak here of only three of the most remarkable; which are, the Pont Neuf, or new bridge; the Pont Royal, or royal bridge just mention'd; and the Pont Notre Dame, or our Lady's bridge.

THE two first are not only very commodious for the city of Paris, but also consti-

tute a great part of its ornament. In fact, the new bridge, and the royal bridge, are two of the finest structures of the kind in Europe: the regularity and solidity of the construction, the prospects they afford, and the continual concourse of passengers, all contribute to render them admirable,

NEW Bridge, or Pont Neuf, was begun in 1570, in the reign of Henry III, and under the direction of James Ardrouet du Cerceau. The civil wars having caused this work to be discontinued, it was not finished till 1604, by order of Henry IV, who made use of William Marchand for the architect.

THIS bridge is 170 fathoms long, and twelve broad, the breadth being divided into three parts: that in the middle, which serves for coaches and other carriages, is five fathom wide; and the two foot ways, or banquets, made for the convenience of foot passengers, take up the rest. Here it appears that the plane of the Pont Neuf very much resembles that of Westminster bridge.

It

IT consists of twelve arches; five on the side of the Augustines, and seven on the side of the Louvre. The middle part, between these two, rests upon the west end of the island du Palais, which here divides the Seine: and this gives a reason for the great length of the Pont Neuf, which, tho' over a much smaller river than the Thames, exceeds that of London-bridge, and comes within 200 feet of the new bridge at Westminster.

THE equestrian statue of Henry IV, is a great ornament to this bridge. It was put up in 1635, when cardinal Richelieu caused to be finished the work which Lewis XIII had begun. The four figures in bronze, of slaves enchained, as the bas-reliefs, which represent the principal actions of Henry IV, were designed and cast by Franceville. The king's figure was cut by one Dupré, a sculptor: but the horse was by Giovanni de Bologna, a disciple of the famous Michael Angelo. It was made a present by Cosmo II, grand duke of Tuscany, to Mary de Medicis, at that time regent.

THE

THE small structure, called la Samaritaine, or the house of the Samaritan woman, deserves notice. Travellers may go into it to see the machine, by which water is furnished to the Louvre, and to many other places in the town.

THIS building was finished in 1715, after the design of Costa; that which was there in the time of Henry IV having been destroyed in 1712. Bertrand cut the figure of our Lord, below the clock, and Fermin that of the woman of Samaria. These two figures, as well as the bason which is in the middle, are of metal the colour of melted brass, and the whole is perfectly well wrought.

Le Pont Royal, the royal bridge, is not so much adorned as the new bridge, but is altogether as solid, and enjoys a prospect not less agreeable. It was built in the room of a wooden structure, formerly called the red bridge. The design was by Julius Hardouin Mansart; and Father Francis Romain conducted the work, which was begun in 1685.

THE

THE length, supported by six arches, is about seventy fathom, and the breadth eight fathom four foot; with foot ways on the sides, in imitation of those upon the new bridge.

PONT Notre Dame, our lady's bridge, was built in 1507, under the direction of Giovanni Giocondo, a cordelier of Verona. There was in its place a wooden bridge, which fell in 1499.

THIS bridge is all along loaded with houses, there being thirty-four on each side. The fronts of these houses are adorned with large termini, bearing on their heads baskets of flowers and fruits. Betwixt these terms are medallions, on which the kings of France are represented: their names, and the times of their accession to the crown, are in French, and the mottos are in Latin. These works are far from being perfect at present.

THE square gate, of the Ionic order, leads to the water engine, which consists of two hydraulic machines, that raise the
water

water of the Seine eighty feet, to distribute it afterwards into seventeen or eighteen fountains. Strangers who visit Paris, generally endeavour to see these machines. By this description it appears, that Pont Notre Dame resembles London bridge in two particulars, viz. this water machine, and the encumbrance of houses on the top of it. We may add a third, the heavy gate upon each.

THE design of the gate on Pont Notre Dame is by Bulet; and the bas-reliefs, which represent a river and a naiad, were by John Gougeon. The Epigram that appears over the arch, graven on a black marble, was composed by Santüeil.

*Sequana, cum primum Reginae allabitur
Urbi,
Tardat præcípites ambitiosus aquas :
Captus amore loci, cursum obliuiscitur, anceps
Quo fluat, & dulces nectit in Urbe moras.
Hinc varios implens fluctu subeunte canales,
Fons fieri gaudet, qui modo flumen erat.*

In

IN . E N G L I S H .

Soon as the Seine the royal city laves,
 Th' ambitious flood restrains his rapid
 waves;
 Smit with the place, forgets his course, in
 doubt
 Which way to flow, and smoothly winds
 about;
 In various channels glides, well pleas'd to
 seem
 A fountain here, that came a mighty
 stream.

SOME authors have found this epigram to
 be as beautiful as that, which Sannazarius
 made for the city of Venice; which we
 here insert also, for the sake of comparifon.

*Viderat Hadriacis Venetam Neptunus in
 undis*
Stare urbem, & toti ponere jura mari;
Nunc mihi Tarpeias quantumvis, Jupiter,
arces
Objice, & illa tui mœnia Martis, ait:
Si Pelago Tibrim præfers, urbem aspice ut-
ramque,
Illam Homines dices, hanc posuisse Deos.

F

Thus

Thus ENGLISHED.

IN Adriatic waves when Neptune saw
 Fair Venice stand, and to the sea give law ;
 Boast thy Tarpeian towers, thy martial
 reign,

O Jove, he said ; thy Tiber to the Maine
 Prefer : each city view, and own the odds ;
 That seems the work of men, and this of
 Gods.

AMONG the many other bridges in Paris, some are with houses, as the Exchange bridge, St. Michael's bridge, &c. Others without buildings upon them, as the little bridge, Tournelle bridge, St. Mary's bridge, &c.—It is but justice here to observe, that we owe this account of the principal bridges in Paris chiefly to the Memorial de Paris, lately printed for Mr. Brindley, in French and English.

IN Italy there are likewise very beautiful bridges, besides those at Rome : that of Alexander Farnese, duke of Parma, is esteemed in particular a very fine one ; but this, and all others, are excelled by the Ponte Rialto, at Venice. This bridge is
 allowed

allowed on all hands to be one of the finest in Europe. It was built in the year 1591, on the design of the celebrated Michael Angelo, and is said to have cost 250,000 ducats: it consists of one single arch, all of marble, has rails on each side, and two rows of shops in the middle. The dimensions of this bridge are as follow: the compass of the arch is just one third part of a circle, the width of it on the level of the water, from one extremity to the other, is ninety-five feet, and the height of it twenty-four.

PALLADIO gives us several designs of magnificent bridges, and mentions most of those built by the Romans; for instance, that of * Rimini, on the Flaminian way; those of Vicenza, on the Bacciglione, and the Perone. He likewise tells us of two stone bridges of his own planning, that are very beautiful: but of these we shall have occasion to speak hereafter.

It is proper just to mention here, that in the bay of Puzzoli there are some pillars

* Rimini bridge is of fine marble, and consists of fifty arches. It was begun by Augustus, and finished by Tiberius.

yet standing, which supported the arches of a famous mole, built for the defence and conveniency of the harbour, in a surprising depth of water : these pillars have been mistaken by several authors for the remains of Caligula's bridge, between Puzzoli and Baia ; whereas it may be demonstrated, from Suetonius and other writers, that that was a bridge of boats.

THE Spaniards have some bridges that are worthy of note. Over the Guadiana, at Badajoz, there is a stately stone bridge, consisting of thirty arches, and above five hundred yards in length. At Saragossa, there are two noble bridges over the Ebro, the one of stone, the other of wood ; which latter is reckon'd the finest of the kind in Europe.

THERE is a very fine bridge at Madrid, adjoining to one of the gates of the city, which is called the bridge of Segovia, on the river Manzanares. It was built by Philip II, and is very long and lofty.

IN the account of the Levant by Poulet, it is said that the bridge of one arch, in the
little

little city of Munster, on the Narrante, in Bosnia, is of a construction infinitely more noble than that of the Rialto in Venice.

To these may be added, the fine bridge over the Mondego, at Coimbra, in Portugal, consisting of a double range of arches, one above another ; and Alcantara-bridge as a piece of antiquity. This bridge was built over the Tagus, in the reign of the emperor Trajan : it consists of no more than six arches, though it is upwards of six hundred feet in length : its height is said to be two hundred feet above the water.

HAVING mentioned the Rialto, we will here observe, that no city in the world has more bridges than Venice : their number is as follows.

	Bridges
In St. Paul's ward are	37
In that of the Cross	35
In that of the Royal Canal	75
In that of the Arsenal	72
In the island of the Jews	9
In that of Dorsadura	67
In that of St. Mark	44
In all	339
	As

As Germany has a great number of large rivers, it has also many considerable bridges: those of Strasburg over the Rhine, and Frankfort over the Maine, are mention'd with particular distinction.

THE bridge of Dresden, over the Elb, is much admired, and thought the finest in Germany: it consists of seventeen arches, and is adorned with barriers of stone well wrought, and an equestrian statue of the present elector, Augustus III, king of Poland. This bridge divides old Dresden from the New, and is equally substantial and curious.

THE stone bridge at Ratisbon is the best of all those upon the Danube, and has nothing equal to it upon the Rhine. It consists of fifteen high arches, each twenty-three feet in width, supported by square pillars, and defended by buttresses against the shoals of ice, which sometimes strike with great violence against it. This bridge is twenty-three feet broad, and 1091 in length: there are three towers upon it, with archways under them. It has antiquity as well as beauty; for it was begun to be built in 1135, and finished in 1156, at the joint charge

charge of the city, and Henry X of Bavaria.

THE bridge of Prague, over the Moldaw, is larger than either of the preceding, and also very substantial : it has twenty-four arches, and is thirty-five feet in breadth, and 1700 in length. At either end is a large tower, with a gate under it, and the statues of several saints on both sides of each.

AT Vienna, the Danube is divided into so many branches by its islands, that though the river be very large, and the bridges over it many, none of them deserve a particular description : but there is a very singular sort of a bridge in the city itself, which ought not to be omitted. The ground plot of one street is so low, that the foundations of the houses in another street, which comes across it, are even with the tops of the houses in the former. At the angles where they meet, a single arch is carried entirely over the lower street, upon which the upper street is continued on a level, without break or interruption.

THE

THE bridge of Francfort, on the Maine, has fourteen stone arches, with a tower also at each end. The Maine here is about half as wide as the Thames at London,

THE Pont Neuf at Berlin, is built in imitation of the bridge of the same name at Paris, and has likewise upon it a fine equestrian statue: 'tis of the elector Frederick William. Both the man and the horse are in one piece, being both cast together. They weigh 3000 quintals, or 300,000 lb. weight,

STRASBURGH bridge wants but little of an English mile in length, and is kept in repair by a toll paid for the passage over it: but we do not find any thing extraordinary concerning the structure of it.

WE must here observe in general, that no tide comes up to any of those German bridges, nor to any of those described in France, except the moveable one at Rouen.

THE usual way of crossing the Lower Rhine is on what they call flying bridges : these consist of a floor laid over two large boats, gravell'd at bottom, and railed on the sides : horses and carriages are convey'd over on them, as well as men and goods, with great ease, by means of a very large and long cable fastened to it at one end, and to an anchor at the other : the anchor is just in the midst of the stream, and betwixt it and the bridge are several smaller boats to support the cable, and which move with it. By these means the bridge is pulled over to the opposite side, and kept from being born down by the stream.

IF we take a step out of Europe, Persia and China in Asia will afford us instances of magnificent bridges. The bridge at Zulpha, one of the suburbs of Ispahan, is represented by Tavernier and Thevenot as one of the finest structures in Persia. It is built of brick, with edgings of free-stone, and is almost level, the middle of it being not much higher than the ends. It is above 300 paces in length, and twenty in breadth, and is supported by a great number of low stone arches : on each side there is a gallery,

lery, eight or nine feet broad, which runs from one end to the other, raised several steps above the level of the bridge, and having frequent openings for the sake of light, the fresh air, and a prospect of the river. If any person desires a more open passage, he may walk upon the plat-form over these galleries : but here the passenger is so much exposed to the heat of the sun in summer, that he generally chuses the covered walk ; which also many times serves for a horse-way in winter, when the river overflows and fills the middle way of the bridge, which is design'd for horses. But what is most remarkable, is another passage when the water is low in summer, and which is agreeable on account of its coolness. This way is almost even with the bottom of the river ; but there are stones so placed, that one may step over without wetting one's shoes, and openings through the piers from one end of the bridge to the other.

As to the Chinese bridges, the most surprising of these structures is that which has obtained the name of the flying bridge, being built over a river from one mountain
to

to another, and consisting, according to the Jesuits, of only one single arch, five hundred cubits high, and four hundred long.—There is, say they, another remarkable bridge in the province of Shanfi, at the conflux of two large rivers, which is built upon 130 barges chained together, but so contrived as to open and admit vessels to pass through, after paying the usual toll.

THE fathers add, that this sort of bridges is common in China; but they have another sort built upon pillars without any arches, and some of these of a great length and breadth; particularly one in the province of Fokein, which is 360 perches long, and one and a half broad. It is all of white stone, supported by 300 pillars, has a parapet on each side, and is adorned with the figures of lions at certain distances, and variety of other sculptures. Some of their arched bridges are likewise of considerable length, breadth, and beauty, especially that of Fuchew, the capital of Fokien, which is above 150 perches long, and consists of an hundred lofty arches. The parapets of this bridge are also adorned with the figures of lions and other animals.

WE mention the Jesuits as the authors of these accounts, because, as it is from them that we have all our magnificent ideas of the Chinese genius, virtues, and arts, we would not have more credit given to the story of the flying bridge, than the honesty of those good fathers may justly command. If we must deduct as much from their relations of the mechanical skill and ingenuity of those people, as the late account of lord Anson's voyage obliges us to deduct from their moral perfections, probably that wonderful arch may not be found more extraordinary than some which are now to be seen in Europe. Great distance, and partial or interested representations, have a strange power of concealing the defects of objects, and even of giving them such beauties and proportions, as vanish before a nearer view. By what we know of the Chinese naval and military architecture, we have no great reason to form extravagant notions of their civil, in which we include the building of bridges.

THERE is a very modern structure now in Europe, which, though not properly a bridge,

bridge, is erected so perfectly according to the rules of bridge-building, that it may admit of some degree of comparison on this occasion. It is the marble aqueduct erected by the late king of Portugal, about half a league north west of Lisbon, betwixt two hills, in order to supply the royal palace, and part of that city with water. This structure, as the author of these sheets is assured by a gentleman who has often seen it, consists of eighteen or nineteen arches, of which the three middlemost, which stand in the valley, are not less than three hundred feet high ; the others growing shorter gradually as the bases of them ascend the declivity of each hill, that they all may equally contribute to support a level plane at the top, along which the water glides in two small marble channels, each of which is the section of a cylinder : these channels have a narrow foot-way betwixt them, and one common arch turned over them both, for security against ill-designing men, who might wantonly or wickedly foul or poison the waters. On each side, without the arch, is another narrow foot-way : but neither the breadth or length of the whole structure is at all comparable to that of West-

Westminster-bridge, though part of it so much exceeds in height: nor is the height so very wonderful, if we consider how small a space it extends, and that the abutments are two natural rocks. We know how high the very houses are built in Edinburgh, where they have the advantage of the side of a hill to support them. It should not here be omitted, that the marble channels are carry'd many feet through the hill next Lisbon, which is higher than the other, after they leave their artificial support. We have been the larger in this description, because we do not remember to have seen this aqueduct ever described before in English.

AND here one cannot well avoid a short reflection on the antient aqueducts, those especially of Rome and Carthage, of which the ruins yet remain. It is not at all irregular to take the structures of this kind into the general notion of bridges, though they are made to carry the water itself, and not to afford a passage over it.

THERE is yet one bridge on the continent of Europe, which we omitted in the proper place, and therefore must take notice

tice of it here. It is the famous bridge of Esseck, the longest in the known world. Indeed, it is remarkable only for its length, there being nothing worthy of notice in its structure, which is of wood, in the plainest manner : for what expence would have sufficed to have given it ornament ? It extends over the River Drave, near its conflux with the Danube, and over the broad, and otherwise impassible marshes which lie on the sides of that river, to the extent, some say, of seven English miles, others of 9000 paces, or 8 English miles and an half, upon the breadth of 24 paces, or 120 feet.

IN the wars betwixt the Turks and the Germans, this bridge has often suffered, parts of it having been burnt by the invader, and still restored by the party that remained in possession. When the Turks had footing in Lower Hungary, it belonged solely to them ; but now, since the victories of the famous prince Eugene over the Ottoman arms, it lies many miles within the dominions of the house of Austria, and is in the common road from Vienna to Constantinople, uniting Hungary with Sclavonia. Though we
have

have no account of its present state, we need not doubt, from these circumstances, but it is kept in pretty good repair.

WE have already just mention'd the bridge of Caligula, in order to correct the vulgar error concerning it: but as it has been hinted to us, that a particular description of that famous bridge, such as it appears really to have been, would be acceptable, we shall here introduce such a description.

CALIGULA, to shew his power and greatness, and that he was able to walk upon the sea, as well as the land, ordered an infinite number of ships to be secured in all parts, and many others to be new built, and all to be brought into the bays of Baia and Puteoli, in Campania, about ninety miles from Rome. These ships being placed in two rows, in the form of a crescent, were fastened and moored together with anchors, chains, and cables, to make them firm and secure; and over these were laid vast quantities of large planks and boards, covered over with so much earth as made it look like firm ground, or one of the streets of Rome; for upon this bridge, which was
above

above three miles and an half in length, extending from the point of Baia to the opposite shore of Puteoli, he built houses and lodgings for the reception of himself and his followers, and by pipes conveyed fresh water from the land to serve the occasions of his revels. When this was done, he, and all his court, with prodigious throngs of all sorts of people, repaired thither, where, after some solemn sacrifices to the gods, he, proudly adorned with stately robes of gold and pearl, sitting on horseback, with a civic crown and Alexander's breast-plate, accompanied with the great officers of his army, and all the nobility and gentry of Rome, entered at one end of the bridge, and, with an awful majesty, rode to the other. After this, lodging all night upon the bridge, he caused such an infinite number of torches, lanthorns, and other lights, to be placed in all parts of the work, as gave him occasion to boast, "that he had turned the night into day, as well as the sea into land." The next day he rode over the bridge in his triumphal chariot, with Darius, an hostage of Parthia, and followed by a mighty train of other chariots, and all his solders in bright armour; which, when he

H

had

had done, he ascended a rostrum, and there made a solemn oration in praise of his own great attempt: and that he might perform something more memorable before he left the bridge, he ordered great multitudes to be thrown into the sea, who all perish'd without remedy.

ENOUGH has been said of foreign bridges, unless the design were, as it is not, to swell this pamphlet into a volume. Let us now spend a few paragraphs on the other bridges of England, and then proceed to our more immediate subject, the new bridge at Westminster.

JULIUS CÆSAR, who laid that famous wooden bridge over the Rhine, which he describes at large in his commentaries, did undoubtedly erect another over the Thames, in order to make war on Cassibelaun. It is pretended, that some of the piles of this bridge are still to be discovered somewhere near Chertsey, where they go by the name of Coway-stakes. But we will not dwell on the British antiquities of this kind, though perhaps as many of them might be found, as in other countries.

IT

It is certain, that as no country in Europe, for the extent of it, is better watered with rivers than England, so no country has, in proportion, a greater number of bridges erected over rivers : for those over the canals in Holland and Venice, shall be here out of the question. That magnificent structure, built over a small rivulet at Blenheim-house, and which is equally a bridge and a triumphal arch, is, perhaps, not inferior to any thing of its kind in Europe, the Rialto in Venice not excepted. It is true, the same sarcasm lies against it, as against the bridge of Segovia, near Madrid, “ *That it would be proper to sell the bridge in order to buy water.*” But when we are pursuing the idea of magnificence, works of ostentation are to be considered, as well as those of real use.

Few people know that we have another single stone arch in England, which, tho’ unnoticed in history, exceeds in the span that of the Rialto so often mentioned ; but we have been assured, by a native of Bishops-Auckland, in the county palatine of Durham, (a man who does not affirm things at random) that there is in that town such an arch over the river Were.

As we did not enquire into other particulars, and had no thought of such a treatise as this, when the means of farther information were at hand, we cannot say any thing of the design and workmanship of Auckland-bridge. If there be any thing curious in these, it would certainly be worth communicating to the publick.

CROYLAND bridge, near Spalding in Lincolnshire, is worth mentioning for the singularity of its structure. It is triangular, and formed by three ribb'd arches, joining in an eye, and therefore so steep, that horsemen, as well as carriages, are obliged to pass under it. The waters of Welland and Nene, by the branch called Cat-water, meet under its center, and mixing there together, flow down through Spalding to the Sea. It commands the intercourse of all the streets of the town, which are built on the sides of those canals. At the foot of that segment which stands next the London road, sits an image of king Ethelbald, with a crown fleury on his head, and a globe in his left hand. We may presume he held a scepter or sword in the other, by what remains.

At Bristol, Newcastle upon Tyne, Stratford upon Avon, Burton upon Trent, and many other places, are bridges that may vie with most of those that are celebrated abroad.

BRISTOL bridge, over the Somersetshire Avon, is exceeding strong, and the arches of it are very high, on account of the depth of water. The tide of flood rises here near six fathom, or thirty-six feet, and runs very strong. It is entirely built over, without any openings to the water, as on London bridge; so that, on passing it, a stranger has no other idea of it than that of a close crouded street.

THE bridge at Newcastle upon Tyne is all covered over in the same manner, and has a gate upon it, which bounds the liberty of the corporation. It consists of seven large arches, and is an exceeding strong and well-built structure. The inhabitants of Newcastle are apt to prefer their bridge to that of Rochester, which we shall mention below; and impartial persons allowed it to be the third in order of English bridges, before that at Westminster was erected, viz. London, Rochester, and Newcastle. Some
years

years ago the gate on Newcastle bridge was thought to save a great part of the town, by stopping a fire which broke out at Gateshead, on the Bishoprick side, and burnt the houses at the south end of the bridge up to it. We do not remember any other bridge in England, except those of Bristol and Newcastle just described, and that of London, which we shall come to presently, that is thus converted into a street.

THE bridge of Stratford upon Avon, (not the same Avon that runs through Bristol, there being several rivers of that name in England) has fourteen handsome stone arches, and a long causeway at the west end of it, walled in on both sides.

BURTON bridge, upon the Trent, is all built of free stone, cut and squared. It seems to exceed, in length, all the other stone bridges in England, having 34 arches, which contain 515 yards, or 1545 feet.

SHREWSBURY has also two fine stone bridges over the Severn, which almost surround it, in the form of a horse-shoe: upon one of them stands a very noble gate, and

and over the arch of the gate, a statue of the famous Llewellyn, the last native prince of Wales, to this day the idol of the Welch.

WE shall mention but one other bridge before we come to those upon the Thames: but on this, as it is one of the most considerable in England, and lies in the main road between London and the nearest part of the continent, we shall be somewhat particular, in regard both to its history and present state. The bridge we mean is that at Rochester, which being formerly of wood, was carried away at the end of a hard frost, by the huge shoals of ice which came floating down against it; but in the room of it, Sir John Cobham, and Sir Robert Knolles, built a curious stone bridge, of eleven arches, with the money raised out of the French spoils. Sir John Cobham, who much furthered the work, erected a chapel, according to the custom of those times, at the end thereof, called, at the first building, *All Souls Chapel*; upon which, besides the arms of saints, were seen the arms of the king and his three uncles, who were then living; and settled a stipend for three priests to pray for himself, Sir Robert

bert Knolles, and all other christians forever: but the iron pallisades, or coping upon the bridge, was set up a long time after it was built, by archbishop Warham.

THE bridge thus strongly erected, a statute was made in parliament, 21 Rich. II. for its future maintenance, whereby several parcels of land were engaged to repair it, whatever defects or breaches might be made in it by time or otherwise, viz.

1. The bishop of *Rocheſter* to repair the first pier, for his lands at *Buſtall*, *Cukelſtan*, *Frendſbury* and *Stoke*.
2. The inhabitants of *Gillingham* and *Chatbam* to repair the second pier.
3. THE bishop of *Rocheſter* again the third pier, for his lands at *Halling*, &c.
4. THE king to maintain the fourth pier, for his lands at *Borham* and *Woldham*, &c.
5. THE archbishop the fifth pier, for his lands at *Wrotham* and *Maidſtone*, &c.
6. THE sixth pier belongs to the hundred of *Heyburn*, and the towns thereof.
- 7, 8. THE seventh and eighth piers belong to the men of *Hoo*, to repair and uphold.
9. THE

THE ninth pier belongs to the archbishop, for *Fleets, Cliffs, Higham, &c.*

BUT this revenue for the maintenance of the bridge being neglected or concealed, it fell almost into irreparable decay ; whereupon a commission was granted by queen Elizabeth, to Sir William Cecil lord Burleigh, then high-treasurer, and other lords and gentlemen of the county of Kent, to examine into the decays, and the causes of them, and to propound means how they might be remedied ; in which Sir Roger Manwood, then lord chief baron of the exchequer, was so active, that he contrived a perfect reformation, and procured two acts of parliament, the one in the 18th, and the other in the 27th of her reign, by which this bridge was not only then repaired, but the revenues of the land settled for that end so increased, that the bridge will be maintained therewith for ever, without other contributions.

IT was thoroughly repaired in the year 1744, and new pallisadoed with iron rails from end to end, excepting that part where three wooden arches now are, in the room

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of three stone ones, which were fallen to decay, and taken down. On the East side of the bridge is the bridge-house, being a neat building, faced with free stone, over which is an handsome clock-house, re-built in the year 1735.

ON the river Thames, from Oxford down to London, are a great number of bridges, several of them not unworthy of a particular description, would our compass admit of it. That at Caversham, betwixt that village and the town of Reading, has this peculiarity, that, though the superstructure be all of wood, one half of it is supported by stone piers, and the other by piles of timber. As the expence of maintaining it lies between the two counties of Oxford and Berks, one must naturally guess from this appearance, that stone abounds most in the former, and wood in the latter.

THE wooden bridge from Fulham to Putney, erected within the memory of young men, and that from Walton to Shipperton, begun but a very few years ago, are both of them good structures, especially the latter, which is highly esteemed by the curious.

ous. Walton bridge consists but of three arches, and yet leaves 218 feet for the water-way. The middle arch is 130 feet in the span, by 26 in height, and the other two arches are 44 feet by 18. This bridge (for the passage of which, as well as that of Putney, a toll is paid) was finished and opened in 1748. There is another to be built from Hampton to Molesey; and doubtless, as the use of many bridges is so evident betwixt counties so populous as Middlesex and Surrey, and just in the neighbourhood of the capital, leave will be obtained from the legislature for more structures of the same kind within a few years.

OVER the Thames, in a line from near the centre of the city to the borough of Southwark, is the famous stone bridge, well known by the name of London bridge: a structure admired by foreigners, and, in most respects, as remarkable as any in Europe. It is particularly noted for the lofty houses and shops built on each side of it, which give it so much the appearance of a common street, that a stranger scarce knows he is crossing a river, till he discovers

vers it by two openings near the middle, which are over the drawbridge. It was erected in the room of a wooden bridge, and finished in the year 1209, the 10th of the reign of king John, having been 33 years in building, at the publick expence.

It consists of 19 arches, is 915 feet long, and 74 wide. The open passage is 20 feet, exclusive of the houses. The mean height of it is reckoned 43 feet and a half from the bed of the river. Under the first, second, and fourth arches from the north side of the bridge, are machines, worked by the flow and ebb of the river, by which the water is raised to such a height as to supply many parts of the city.

THE greatest singularity in London bridge, is the artifice made use of to preserve the stone piers, by casing them round to a great thickness. These cases, which are called sterlings, greatly contract the passage, and add to the fall, by stopping the current, of the water. They are kept in repair at a vast and continual expence; by which means the piers themselves, after

540 years, are still found and good within the water, and the whole structure is in no danger of failing, notwithstanding the prodigious pressure against it, twice in every tide.

IN less than four years after the building of this bridge, it suffered much by a fire that broke out in Southwark, and catching at the other end, great numbers of people were lost by being inclosed between the two fires, or drowned by crowding in such numbers on board the vessels in the river as sunk them.

ADJOINING to the draw bridge is a building, said to be framed in Holland, and set up here, without the least bit of iron in it, and therefore called the none-such house. The gate here, the only avenue to London by land from Surry, was one of the four principal gates of the city, long before the conquest. It stands now near the south end of the bridge, where is a strong portcullis. This gate was rebuilt somewhat more than 20 years ago, having suffered much by a fire, which burnt up to it from Tooley-street in Southwark.

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As the narrowness of the passage on London bridge, between the houses, (tho' it be now wider than in former times,) is still found a great inconveniency, the city of London seems resolved to remedy it in some measure, as the leases of the houses fall, and occasion offers to rebuild them. Upon this plan they have erected a row of new houses, with a cloister before them, along part of the east side, near the London end; which not being so deep as the old buildings, will much enlarge the thorough-fare, when the whole street comes to be rebuilt in the same manner.

It had been a more noble and publick-spirited, though less frugal resolution, to have quite disincumbered this antient and stately edifice of all its unnatural load, and devoted the whole plane of it to the wheel and foot passages, as is done in that of Westminster: but the houses on London bridge bring in so great a revenue to the city, which takes care of its repairs, that it is hardly to be expected such a fund will ever be given up.

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To superintend the repairs of this bridge, besides an annual committee of aldermen and commoners, there are two officers called bridge-masters (who have other officers under them) chosen by the citizens in a common hall, and rechosen every Midsummer day, that in case of neglect or corruption, they may be removed, as once happened to the head bridge master within our memory : but on good behaviour they are always continued for life. On the death of one of these bridge masters, there is always a great struggle among the decayed citizens to succeed him ; of which we see an instance at the very time of writing this. More will be said of London bridge, while we are treating of that at Westminster.

THE project of a new bridge, for the use of this adjacent city to London, had been long formed before any steps were taken towards the carrying it into execution. It had even been petitioned for to parliament, and rejected upon a petition against it by the Londoners. But the public utility of such a structure was so very evident, that reason at last prevailed against prejudice and
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particular interests. The citizens of London however did not cease to be alarmed at every motion that was made on this occasion. They remonstrated against it in such terms, as if the very existence of their trade and welfare depended greatly on the absolute defeat of such a scheme for ever : whereas it was evident at that time to all unprejudiced persons, that unless London-bridge were pulled down, and the ships could get up to Westminster ; and unless the quays and the custom-house were removed further up the river, London must still be the grand emporium of foreign merchandize, upon which all the other branches of our trade chiefly depend.

As to shops for the retailing of all commodities, they will always be found where there are great numbers of inhabited houses, and might have been equally numerous in Westminster, whether the bridge had or had not been erected.

THE city laws would indeed be so far from preventing this, that the expence which attends obedience to them has been often found too powerful a motive, without

out any other concurring with it, to drive the free citizens into habitations, where they would live with greater freedom. We have seen London greatly decay within 20 years past, when Westminster bridge did not exist to do it any harm. We may see it revive and flourish under other management, when the citizens shall more impartially consider their own true interest, as they seem to begin to do, in spite of Westminster bridge now opened, and though never so many other bridges should be erected over the Thames. But these truths, tho' very demonstrable, would take up too much room to demonstrate within the compass of our present design.

THE body of watermen, whose livelihood depended on their business on the Thames, and who had gone through a seven years servitude, to intitle them to the privilege of following that occupation, had the most plausible plea against the erection of a bridge at Westminster. They were spirited up to make the most of this plea, which was justly attended to, though that of the city was over-ruled. It could not be doubted but that many of them would lose

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their bread, when a passage could be had over that part of the river with safety and without expence: accordingly it was enacted by parliament, that such a sum of money as was thought might be equal to the damage sustained by the petitioners should be paid by the commissioners of the new bridge, into the hands of the watermens company before the bridge was opened, towards the support of the poor men who might be sufferers on this occasion.

THERE might have been another method taken, a method perhaps more useful to the state, though not thought quite so consistent with British liberty ; (yet much more consistent with it, in the opinion of good judges, than the arbitrary custom of impressing men for his majesty's service ;) and that was, to have inrolled the men who lost their employment by means of the bridge, for the use of his majesty's fleet, and to have allowed them a small subsistence in time of peace, as well as full pay in time of war, or when they were in actual service.

BUT

BUT it is an established maxim in policy, and which was alone sufficient to arm the advocates for Westminster bridge, that a great and general benefit should not be obstructed, through fear of a small and partial evil. When compared with the great advantages, or at least conveniences, that may be expected to flow from a bridge at Westminster to a very great part of the kingdom, the interest of the watermens company, and the unreasonable prejudices of those citizens, who formed their judgment upon narrow and weak principles, were not to be brought into competition with them by the British parliament, whose care should extend equally to the whole community.

ALL the difficulties being at last surmounted; by an act of parliament passed in the 11th year of his present majesty's reign, it was enacted, that the bridge should be built from the Wooll-staple, or thereabouts, in the parish of St. Margaret in Westminster, to the opposite shore in the county of Surrey. And a list of commissioners, with Henry late Earl of Pembroke

at their head, was made out and established, in order to direct and superintend this work, which was to be carried on at the public expence.

IN consequence of these determinations and proceedings, several observations were made to find out the direction of the stream in that part of the river, at different times of the flood and ebb; and several accurate surveys of the adjacent shores being taken, Mr. Labeley, the architect, laid before the board what situation appeared to him most advantageous; which being approved, proper marks were made, in order to place the bridge according to the following direction:

THE middle line of the New Bridge was to reach the Westminster shore, about four feet to the northward of the corner of a brick-house, which was then standing on the south-side of the Wooll-staple dock: and the middle line of the said bridge was to reach the opposite Surrey shore, about fifty feet to the northward of a slip or passage, commonly called by the name of Matthew's Caulway. These particulars will preserve the old situation of places, the very names of

of which will probably be now discontinued ; and consequently very soon forgot.

THE position of the new-bridge, in respect to the points of the compass, are almost due East and West ; and it was contrived that the stream of the tide, both flood and ebb, should pass through the arches without any sensible obliquity, unless during the first quarter of the flood ; at which time the stream runs from Whitehall to Lambeth ; but there being then but little water in the river, all the large and deep-loaded vessels delay going up till some time after, when the tide runs with less obliquity. Had the bridge been placed in a situation the most favourable to the stream at young flood, it would have been very advantageous at all other times.

THE breadth of the river at the place where the bridge is erected, was measured two different ways ; first, by trigonometry, viz. a basis of near 700 feet being measured along the Surrey shore, and the proper angles being observed, the calculation gave for the distance intercepted between the Wooll-staple-dock and the opposite wharf

1216 feet: secondly, it was measured actually with a wooden beam of 100 feet in length, laid on the surface of the river at dead low water, and was thus found to be 1223 feet; whence a mean being taken between the trigonometrical and actual mensuration, Mr. Labely thought it might safely be concluded that the breadth of the river at that place was near 1220 feet, which is about 300 feet wider than at London-bridge, very near 200 feet wider than at the Horse-ferry, and about 200 feet narrower than over-against Whitehall and Scotland-yard, on account of the ebbing of the river over-against those last-mentioned places.

THE stream of the river, where the bridge stands, is divided into two channels; in the one, called the ebb-channel, which runs along near the Surrey-shore, the water is about six feet in depth at a common low water; and in the other, called the flood-channel, which runs along the Westminster-shore, the water is about five feet nine inches deep at a common ebb: these two channels are divided by a shoal of a considerable length and breadth, made up of
sand

sand and of the washings or filtrings of the river. Upon the shoal the water is seldom more than four feet in depth at a common low-water.

THE rise of the tide in this part of the river is very uncertain, being seldom less than seven feet at neap-tides and in drougthy seasons, especially when the wind is upon any point of the compass between the south and the west; and the rise of the tide is seldom more than fifteen feet at extraordinary spring-tides, joined with the land-waters, after rainy weather of some continuance, particularly if the wind blows from any point of the compass between the north-east and the north-west. At a mean tide the water may be computed to rise about ten or eleven feet perpendicular.

THE velocity of the surface of the water, during some part of the tide of flood, is sometimes greater than at any time of the tide of ebb; the former being near three feet *per* second in this part of the river; the latter not more than three feet and a half.

THE ground under the bed of the river, particularly where the two middle piers stand,

stand, is a bed of hard gravel, at about three or four feet under the surface of the bed of the river ; and the depth of it is very considerable.

As to the other parts of the bed of the river where the bridge is, the hard bed of gravel extends about three quarters of the whole breadth of the river from the Westminster shore ; and under the remaining part of the breadth of the river, - next the Surrey-shore, is a thick bed of sand, dirt, and mud, several feet in depth : however, it was found to be solid enough to build upon ; and though there was some suspicion of its being defective, yet the piers on that side have (upon the experiment) proved firmer than one of those on the side of Westminster.

BEFORE the manner of laying the foundation of the piers is explained, it will not be amiss to premise a short description of the design of the bridge, and to shew what effect it was then, upon calculation, expected to have on navigation, and what was the greatest fall of water that it would occasion under the arches.

AMONG

AMONG the several designs that were laid before the commissioners, in May, 1738, one was offer'd by Mr. Labely for building a stone bridge, consisting of thirteen semi-circular arches, springing from about one foot higher than low-water mark, and twelve piers; the greatest arch not exceeding seventy-six feet in diameter, and all the others decreasing by four or five feet each, on each side. The two largest of the twelve piers to be seventeen feet wide, and all the other piers to decrease, each by one foot in breadth, on each side of those large piers: the foundation of each of those piers to extend several feet all round the piers, in order to give them a proper basis or footing, and to be laid at about five feet in depth, below the surface of the bed of the river.

THE number and dimensions of the arches and piers were approved, and it was resolved that such piers should be erected, as high as where the springing of the arches should be; that is, one foot, or thereabouts, above low-water mark. Thus far the same piers were necessary, whether the arches over them were of stone or of wood.

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As the latter were at first thought of, it was then very judiciously determined, that over these broad piers there should be erected little piers, or shafts of solid stone, each of these to be as long as the bridge was to be wide, which was fixed by the board at forty-four feet; and fifteen feet in height, in order to reach some feet above the surface of high-water mark: the breadth of each of those shafts was to be eight feet for the first, and five feet in height; seven feet for the next, and five feet in height; and six feet for the last, and also five feet in height; finishing with a large torus or cordon: over those shafts the honourable board had ordered a curious and extremely well-contrived wooden superstructure, of the invention and design of Mr. James King, to be erected: but as a bridge all of stone was finally resolved on, before any of the piers were finished, these shafts were omitted, and the whole work carried up together from the springing of the arches.

FROM what has been said of the width of the arches and the strength of the piers,
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it will appear, that supposing the whole breadth of the river 1220 feet, the length of the bridge itself must be 994 feet. That the greatest breadth of all the piers taken together, would not amount to more than 174 feet, and the voids or openings of the thirteen arches, not to less than 820 feet, left free for the water-way; which still would be increased by turning an arch under each of the abutments: and which was afterwards done, in consequence of another resolution.

FROM these numbers, and the observations mention'd above, the perpendicular height of the greatest fall that could ever happen under the arches, was computed by Mr. Labeley; and notwithstanding the very large allowances made, it was found that it could never amount to three inches and three fourths; which is so insensible a fall, as can prove no obstruction at all to the navigation; and it appeared also, from calculation, that such a bridge could not raise the water in the river at spring-tides sensibly higher than usual, or sensibly alter the duration of either flood or ebb.

ACCORDING to a short and easy rule; shewn to Mr. Labely by William Jones, Esq; for determining the perpendicular height of the fall occasion'd in any stream by a bridge, or any other obstacle, the perpendicular height of the fall under Westminster-bridge was found not to exceed two inches and five eighths, supposing the greatest velocity of the surface of the ebbing waters to be two feet and an half *per* second, as it has been observed; and if that velocity was three feet *per* second, as Mr. Labely supposed it, to have the greatest fall possible, this rule gave for the perpendicular height of the fall three inches and three fourths, the very same as according to Mr. Labely's calculation.

THIS rule, applied to London-bridge, also gave for the perpendicular height of the fall, when the velocity of the stream just above that bridge is three feet two inches *per* second, about four feet nine inches. And as this was found agreeable to experience, the rule itself was sufficiently confirmed.

THE account of the method explained to
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the board for laying the foundation of the piers, is as follows :

THAT the foundation of every pier should be laid on a strong grating of timber planked underneath.

THAT this grating should be made of the bottom of a vessel, such as is called a caisson by the French,

THAT the sides of this caisson should be so contrived, as to be taken away after the pier should be finished,

THAT the bed of the river should be dug to a sufficient depth, and made level, in order to lay the bottom of the caisson, and the foundation of the piers, out of all future danger.

THAT where the ground under the excavation or pit should prove good, there would be no necessity for piling it; but that in case the ground under the foundation-pit should not prove of a sufficient consistence, it should be piled all over as close as necessary; the heads of these piles to be
sawn

sawn level, close to the bottom of the pit ; and on the tops of the piles, thus sawn, the grating and foundation of the piers should be laid.

THE month of July, 1738, was spent in getting ready and preparing the timbers, making necessary tools, and in constructing an engine to drive the piles.

IN the beginning of September, the engine for driving the piles was finished and tried, and whilst the carpenters were at work on the grating and planking for the caisson of the first pier, fir-piles about thirteen or fourteen inches square, and about thirty-four feet in length, were drove in. The points of those piles were shod with iron in a particular manner, to penetrate the easier into the hard gravel, and the top of them was fortified with a large and thick iron hoop, which was taken off to serve for the same use again, after the piles were driven as low as they could be, without danger of breaking or splitting them ; which was about thirteen or fourteen feet below the surface of the bed of the river.

ON the 13th of September, 1738, they drove the first pile; and, on the 26th of October, the piles for building the two middle piers were all driven in. The number of piles necessary for building the first large pier, was only thirty-four long ones, and twenty-two short ones; and for the other large pier, twenty-six long ones only.

THE engine used in driving the piles, was the invention of Mr. James Vauloué. It gave about forty-eight strokes *per* hour, with a ram of 1700 lb. weight, by the help of two horses, and about seventy strokes *per* hour, by the help of three; the ram rising twenty feet for each stroke. And by the force of three horses going a common pace, where the height to which the ram was raised did not exceed eight or ten feet, the engine gave above five strokes in two minutes. The whole work was carried on by means of a large stage, laid upon lighters extremely well moor'd.

ABOUT the beginning of October the grating of the first pier was finished, and the
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sides of the caisson * began to be laid upon it. These sides were about sixteen feet above the grating.

THE sides of the caisson were made of fir-timbers, laid horizontally and close over one another, pinned with oaken trunnels, and framed together at all the corners of the caisson, except the two points, or salient angles, where they were secured with proper iron-work. These sides were planked a-cross the timbers, inside and outside, with three inch planks in a vertical position. The whole thickness of these sides was eighteen inches at bottom, and fifteen at the top. In order to be farther strengthened, every angle, but its two points, had three oaken knee-timbers, properly bolted and secured. These sides, when finished, were fastened to the bottom or grating by twenty-eight pieces of timber on the outside, and eighteen withinside, called straps, about eight inches broad, and three inches thick, reaching and lapping over the top of the sides.

* In this caisson were 150 loads of timber, and its tonnage and capacity was more than that of a forty gun man of war.

The lower part of these straps had one side cut dove-tail fashion, in order to fit the mortaises that were cut to receive them in the outermost kerb of the grating, and kept in their respective places by iron wedges. The use of these straps and wedges was as follows :

WHEN the pier was built up so much above low-water, as no longer to want the caisson for the masons to work in, the wedges being drawn up, gave liberty to clear the straps from the mortaises; the consequence of which was, that the sides rose by their own buoyancy, leaving the grating under the foundation of the pier, which grating extends about 5 feet all round, beyond the stone-work, by way of footing or basis.

AND in case of any unforeseen necessity, before the pier was carried to its proper height, care was taken that the iron-work at the angles might be unscrewed, and the caisson would fall asunder in two halves.

TOWARDS the end of October the same year, the ballast-men began to make the excavation, or foundation pit, for the western-

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most of the two large piers. They dug it near 6 feet in depth, and the dimensions of the pit were of the same proportion and shape as the caisson.

THE digging of the foundation was directed by the help of a great number of gauges, each of which consisted of a stone about 15 inches square, and 3 inches thick, in the middle of which was fixed a wooden pole, 18 feet in height, divided into feet and inches from the bottom of the stone, the pole painted red, and the numbers and divisions white, the easier to distinguish when the level surface of the water intercepted equal portions of those gauges.

ABOUT this time the caisson was finished, with a sluice towards its bottom; and all necessary iron-work, to moor or fasten it by, all the seams or joints caulked, and the bottom and outside painted or pitched over.

ON the 15th of January 1738-9, the caisson was launched very successfully.

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ON the 29th of January the masons began to hoist stones into the caisson.

IN the beginning of February, by lifting the gate of the sluice, near the time of low-water, the caisson was sunk with the stones in it, to try the foundation. Then the water being pumped out, it was made to float again; and on the 17th it was suffered to sink for the last time.

ON the 23d of April, being the festival of St. George, the necessary apparatus for building was taken away, and this first pier remained entirely compleated, having been executed with all the success that could be desired.

THE same method was followed in the construction of the second, and all the other piers. It would be tedious to give the history of each, which could be only a repetition of the same terms of art, and methods of operation. Were we writing only for the use of architects, something of this might be necessary; but in such a narrative

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as this, designed for general information, superfluous,

ONE thing however must not be omitted, before we proceed any farther ; and that is, that though Mr. Labely was of opinion, that to drive piles under all the piers would be a needless expence ; and that it was utterly improbable any of the piers, constructed according to his method, could sink and give way, unless where there was a manifest defect in the foundation ; and though his judgment was, on this occasion, suffered to prevail ; yet the contrary opinion was strenuously maintained by other skillful architects ; particularly by Mr. King, who not only urged the necessity of piling, but offered to perform the work at such a reasonable price, that disinterested persons have thought it not an instance of good œconomy to save such an inconsiderable sum (about 5 or 6000 l.) in a work of such importance and expence. If the hazard appeared to be never so small and improbable, yet since the event that hath since happened was possible, in the nature of things, it was but common prudence to provide against it ; especially as the additional expence

pence would not have been more than one part in sixty or seventy of the whole charge of erecting this bridge.

IN Mr. Labely's account, which he laid before the commissioners, and afterwards published for the sake of the curious, there is a scheme of his first design concerning the thickness of the piers, and the void to be left for the water-way. This scheme was so satisfactory, that no improvement seems to have been afterwards made to it, except in relation to the abutments, under which two arches, of 25 feet each, were turned in the progress of the work; which added 50 feet to the water-passage, and took 25 feet from the solidity of each abutment. These 25 feet on each side, added to 12 feet for another pier that became necessary, and the 77 feet 1 half left for the abutment, make only 1 foot 1 half more than was at first projected for an abutment entirely solid. But the reader will compare this table with that which shall be inserted some pages after it,

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*Dimensions of the Bridge, according to Mr.
Labeley's first Design.*

Westminster abutment	113	Feet
First arch	52	
	12	First pier
Second arch	56	
	13	Second pier
Third arch	60	
	14	Third pier
Fourth arch	64	
	15	Fourth pier
Fifth arch	68	
	16	Fifth pier
Sixth arch	72	
	17	Sixth pier
Middle arch	76	
	17	Sixth pier
Sixth arch	72	
	16	Fifth pier
Fifth arch	68	
	15	Fourth pier
Fourth arch	64	
	14	Third pier
Third arch	60	
	13	Second pier
Second arch	56	
	12	First pier
First arch	52	
	113	Surry abutment

Whole breadth	1220	of river Thames
Length of 2 abutments	226	
Section of the 12 piers	174	
Span or opening of the 13 arches	820	

It has been observed, that the first design was only to build piers of stone, and lay over them a superstructure of wood: but it being found, upon enacting the law for the first lottery to defray the expences of this work, that, either the zeal of the public to promote it, or the itch of the people to gaming by authority, tho' with manifest odds of 15 per cent. against them, it would not be difficult to procure money sufficient, another resolution was taken to make the whole structure of stone, which has accordingly been pursued. But the state wanting larger sums of money for the more pressing occasions of the war, and lotteries being found an easy way of coming at the purses of the people, it was thought proper, after 1741, to grant the money required for carrying on and perfecting the bridge, out of the annual supplies, and divert, with great œconomy, the spirit of hazard wholly to the service of the public. The several sums play'd for and lost, or absolutely granted, for building this bridge, and procuring the several conveniences requisite thereto, are as follow:

Lot-

			£.
Lottery	1737	—	100,000
Lottery	1738	—	48,750
Lottery	1739	—	48,750
Granted	1741	—	20,000
	1742	—	20,000
	1743	—	25,000
	1744	—	15,000
	1745	—	25,000
	1746	—	25,000
	1747	—	30,000
	1748	—	20,000
	1749	—	12,000
			389,500 £.

By the laws which gave power to erect this bridge, and raise money by lottery for that purpose, a further power was given the commissioners to purchase such houses as they thought proper, at a valuation by arbitrement, in order to pull them down, and open proper avenues to the bridge, and build such new streets as should be found necessary to render the passage commodious. A good deal of the money granted must have gone in these purchases (some of which, where the possessors enhanced the

the

the value of their property, were made at a dear rate,) and in the streets which have been laid out, and in part built, as openings to this bridge. But these will be a continual estate for keeping the bridge in repair, and paying the salaries of officers and servants to take care of it: and as, in all probability, it will be long before the bridge requires much to be bestowed on it, the rents of the tenements already let must make a great progress in the building of others, in order to improve this estate to the uttermost.

WE should not here omit, that besides the many salaries that have been paid all the time the work has been going on, some houses were erected, especially for the use of the master workmen. But we must not be too minute in particulars. It is sufficient here to observe, that, under the direction of the commissioners and Mr. Labely, the principal workmen were,

Mr. Andrew Jelphs — Head Mason.

1st. Mr. James King,	} Carpenters.
2d. Mr. William Etteridge,	
3d. Mr. — Reuby,	

N

Some

Some interruptions, in a fabrick of this magnitude, might be expected to intervene, occasioned by the weather, the scarcity of stone, the distance of the quarries, and the uncertainty of the carriage, with other causes that need not be enumerated. The progress of the work, however, was so great, that, in the midst of a very expensive war, carried on almost the whole time against Spain, and a good part of the time against both France and Spain, (a war that annually added millions to the national debt) not only all the piers were erected, but the ceilings were turned over them before the end of the year 1746, being the twentieth of the reign of his present majesty king George II. What the state of the bridge then was, before any misfortune was seen or apprehended in it, and what it now is, except the alterations which that misfortune occasioned, will best appear from a summary account of it then published.

WE have before observed, that the river Thames, where this bridge stands, was found by the beam to be 1223 feet, and by trigonometrical observation, only 1216 feet wide ;

wide; betwixt which two a mean of 1220 feet was supposed to be the true width of the channel. Now as the plane of the bridge is not level, but about 20 feet higher in the middle than at each end, the actual mensuration of that plane must considerably exceed even the actual mensuration of the bed of the river: a curve line betwixt any two points being longer than a right line betwixt the same points, in proportion to the sweep or convexity of its curve.

It has been further observed, that tho' the river be 300 feet wider here than at the horse-ferry, (where the width is much the same as at London-bridge) yet this place was preferred by the commissioners. The reader ought to know the reasons of this preference, which were chiefly these two.

1. The more easy communication with the roads on the Surry side, and with the principal parts of Westminster; particularly the houses of parliament, the courts of law, and the publick offices of state. 2. The advantages arising to the navigation under, and to the passage over, from these 300 feet of greater length; by having almost the same water-way, after the thickness of the
piers

piers are deducted, as at the horse-ferry, and rendering the declivity on both sides, to the top of the center arch, the less perceptible and inconvenient,

WHEN it was resolved that the bridge should be built all of stone, and that two abutment arches should be added to those in Mr. Labeley's first design, (according to the hint he then gave,) the scheme of thinner or narrower piers, or shafts over the large piers, was laid aside, and the latter were carried up to the springing of the arches with only a regular and gradual decrease; and the solid abutments, which in the first design was to be 113 feet at each end, was reduced to only 77 feet and a half at each end, extending as a breast-work on each side above and below the bridge 25 feet, with a handsome flight of stone steps, for landing goods, &c.

THE whole breadth of the bridge is at least 44 feet, which affords sufficient room for 3 carriages and 2 horsemen to pass abreast without interruption or danger, besides 7 feet on each side (not reckoning the

the recesses over the piers) for a foot-way * ; which is raised up about 12 inches, and paved with broad moor-stone ; and the ascent, now quite paved and finished, is but one foot in 30.† The arches are 13 large and

* The more exact dimensions are as follow :

		Feet	Inches
For the carriage way	—	28	— 4
Breadth of the foot-way, and thickness of the parapet wall on each side 7 feet 10 inches	—	Together 15	— 8
		44	0

The ballustrades upon the parapet wall are three feet high, the wall itself being a convenient height to look over ; so that by both together the sides are extremely well secured against any accident.

† This may shew us exactly how much the middle of the bridge is higher than the ends. The thirtys in 610 (which is half the length of the bridge) are 20 1 3d ; and so many feet at least must this difference be. We may also observe further here, that the eye at only 5 feet above the pavement, will be in a horizontal line over the highest part of the middle arch, at 150 feet distance from it, and discover objects of equal height at the same distance on the other side ; which is sufficient to give notice of any thing coming, that a foot passenger has need to avoid. As to horsemen and coachmen, they discover yet farther, at the rate of 30 feet, on each side, for every one, that their eye is more than 5 feet above the pavement. We are the more particular in this point, because the strongest critical objection we have heard made against Westminster-bridge, now it is finished, is, that it is not carried over on a level ; but that was impossible, without rendering it very incommodious to the inland navigation, which is of such great importance to the capital.

and 2 small. The piers are 14 ; the length of each about 70 feet, each end terminated with a saliant right-angle against either tide. These piers, which are at bottom four feet wider than at the springing of the arch, are laid, according to the first design, on a strong foundation of timber two feet thick, shaped in the same manner, about 80 feet long, and 28 wide ; and is of such sound plank, that, being kept always wet, it will not rot, but grow harder by time. Some of these foundations are laid 14 feet under the bed of the river, and some only 5 feet, according as a stratum of gravel could be found, which was much lower on the Surrey-side. Thus the depth of the piers is different ; but they are built alike, inside and out, of solid Portland blocks of 1, 2, 3, 4 and 5 tons weight, and none less, except key-stones ; all set in and the joints filled with Dutch terrass, besides cramp'd together by iron, which is not to be seen now finished. Between these piers (which take up 353 solid feet) the water has a free course of 870 feet, which is more than 4 times the space for the water-course between the ster-

sterlings at London-bridge *; so that here is no fall of water to endanger the smallest boat, and the stream is so gentle that it seldom exceeds the velocity of 2 feet and a half *per* second in tide of flood, and is a quarter less in the ebb. Experience, in this respect, confirms the calculations made at first.

ALL the arches, which are semicircular for the greater strength, spring from about 2 feet above low water mark: this is much stronger, and occasions a less ascent, than if they sprung from higher piers, beside the saving

* Dimensions, &c. of London bridge.

Breadth of the arches, or water passage above the sterlings	feet in.
	521 2
Breadth of the stone piers	393 11
Breadth of the whole	915 1
The breadth of the sterlings	611 0
The breadth of the gullet or water passage between the sterlings	228 10
	839 10

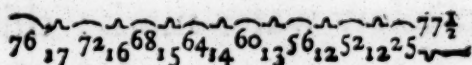
Breadth of the river at Putney-bridge.

Between the present banks	847
Passage left for the water	700

Widest part of the Thames above London-bridge.
From Hungerford-stairs to the opposite shore,
where the river bends,

1520

saving of materials and workmanship.——
 The middle arch is 76 feet wide, and the rest decrease each 4 feet, till the abutment arch, which is about 25 feet, and the abutment 77 and a half. The piers between decrease one foot, the greatest being 17 feet wide at the springing of the arches, as represented, by the following lines, the uppermost figures being the breadth of the arches, and the lower the dimensions of the piers.



and so for the other half.

THE soffet, or ceiling, of every arch, is turned and built quite thro' with large Portland blocks, over which is turned another arch of Purbeck stone, bonded in with Portland, and 4 or 5 times thicker on the reins than on the key; by which, and the incumbent weight of materials, all the parts of every arch are in equilibrio; that is, the thrust and lateral pressure are counterbalanced, so that each of these arches might stand single without affecting or being affected by any other.

SEVERAL

SEVERAL feet below the pavement, between the arches, drains are made to carry off the water and filth, which might rot the work, and is a new contrivance.

As the tide rises in this part of the river seldom less than 8, or more than 15 feet perpendicular; therefore at the highest tide 25 feet will be left for passage, under the largest arch. There being a large shoal in the middle of the river, we have noted that it is there at low-water but 5 feet deep; whereas in the channels on each side the shoal, it is from 7 to nine feet deep; so that on the top of a spring or high tide, the water is 20 feet deep in the middle, and 24 in the said channels.

IN a word, the author of this description affirms, that the long bridges at Ratisbon and Dresden in Germany, at Lyons and St. Esprit in France, and near Madrid in Spain, are not equal to this, either for strength or magnitude, regularity, or quantity of water which they cover.

THE stone used is of four sorts, each the best in its kind, *viz.* Portland, Purbeck, Cornish moorstone, and Kentish rag-

O

stone;

stone; all used according to their proper quality, and so disposed that there is not a false bearing or joint in the whole; and whatever ought to be of one stone, is not, as in other buildings, made up of several small stones. By this care every part is properly supported. The two largest piers contain 3000 cubic feet, and near 200 tons of solid *Portland* stone: and the quantity of solid stone to the largest arch, exclusive of the freeze, cornice, foot and carriage way, is about 500 tons; and it is computed that the value of above 40,000 *l.* in stone and other works are always under water or under ground. *See Sup. to Gent. Mag.* 1746.

THE greatest part of the year 1747 having been spent in raising the parapet-wall, in erecting the ballustrades over it, and in paving the several ways, it was expected that the bridge would be opened for all passengers and carriages before the end of that year. But early in autumn it was first discovered, and within a few weeks after it was extremely obvious, that the third pier from the center, or fifth from the shore on the Westminster side, had began
and

and still continued to sink ; so that the two arches which rested on it departed from their circular figure, were broken in several places, and some of their principal stones fell into the water ; in a word, they seemed both in danger of falling entirely into the river.

THIS event did not less surprize, than it perplexed those who had the conduct of the work, and who thought their labours almost at an end. The pier that sunk was neither one of the last erected, nor were the arches it supported the last that had been turned : so that whatever the hazard might have been at first to build without piling, that hazard, with respect to this part of the bridge at least, was thought to be entirely over. But art can no more prescribe a time for natural accidents, than it can absolutely predict the certainty of their advent : the most it can do, is to make the best human provision against them, which was here neglected.

NOTHING was now to be done but to lessen the weight, incumbent on the pier, by taking off the arches with all expedition,

lest they should fall, and obstruct the current of the river, and create a new task to remove the stones. This was effected with success by a fresh application of wooden centers, such as had been used in first turning them, but which required a new contrivance to introduce them under the broken arches, and raise them so as to sustain their weight. All this was accomplished by a proper recourse to the mechanical powers.

THE arches being removed, it was now requisite to see how far the pier could be sunk by the perpendicular pressure of some body of its own horizontal dimensions, which might sink with it without any of the hazard that attended the arches. A pile of iron cannon was thought of for this purpose, and accordingly used, being easily procured from his majesty's stores at no great distance. The interstices betwixt these cannon were filled up with weights of lead, and other heavy materials, the whole amounting to 12,000 ton. The commissioners daily watched the effect of this experiment, and found that the pier still continued sinking several months after the weight

weight was laid on. Above a year was lost, before it could be determined in what manner to repair the defect.

DURING this time many projects were laid before the commissioners, the tendency of all which was, to throw off the weight of the new arches from the sinking pier, of which the foundation was still thought precarious, upon the piers that were next it on either side. This was indeed the chief thing to be done, and the difficulty was only in the choice of the best method of doing it. We must not dwell too long on this accident. It is sufficient to say, that in the summer of 1749, the work was set about, and in the following summer was compleated. The pier that had failed was eased of its burthen, and yet the appearance and symmetry of the whole bridge was the same as before the accident happened. This is enough to say to those who are not architects, or not over-curious in mechanical enquiries; and it is for these chiefly that we write this account.

THREE whole years was the use of this noble structure retarded by this accident;
for

for it was the 16th of November, in the year now expiring, before the bridge was opened for public use.

BUT as soon as it was commonly known, that this event might be expected, such crouds of people pressed to obtain admision at the ends of the bridge, that the commissioners thought proper to publish an order to prevent more applications of the same nature, and to deter their servants from accepting gratuities to comply with the terms of such applications. A little disturbance was once occasioned on a Sunday, by the ungovernable curiosity of a croud, in consequence of this order.

WHEN the commissioners advertised the day of opening the bridge, which was also a Sunday, disgust was taken by some persons at this circumstance, and a letter appeared in a public paper to exhort them to fix upon some other day for that purpose. But the common people, who form the croud on such occasions, are so accustomed to turn the Sabbath into a day of festivity and pleasure, that the commissioners seem to have thought it more eligible to make this event
the

the subject of one such holyday's entertainment, than to deprive those people, and the whole community, which hath so much interest in their labour, of one day which by law and custom is devoted to the purposes of industry.

CARE was taken to begin the 18th of November as early as possible. No sooner had St. Margaret's clock struck the hour which divided the 17th from the 18th, but a large company of the inhabitants of Westminster and others, being assembled for that purpose, walked in procession over the bridge. Music was play'd before them, Guns were fired, and other common demonstrations of a public rejoicing were exhibited. The particulars of this ceremony are so recent in the news-papers, that it is needless to repeat them here.

A guard, consisting of twelve watchmen, is appointed for the security of the passage over this bridge. They are to be upon duty from the close of day every night, till the opening of it the next morning. We walk the public streets with so much danger in those hours, that this provision was
extremely

extremely necessary upon a bridge of so great length, which is not to be transformed into a street. The recesses over each pier, which are built in the form of alcoves, and designed as places of shelter in bad weather, or of retirement in case of an accidental danger or difficulty in the passage, might have otherwise served for places of ambush to robbers and cut-throats; though indeed even these occupations, which thrive so much in our time, could not have been followed here without hazard, as there is no way of escaping but at the two ends of the bridge. In this Westminster bridge has greatly the advantage of the Pont Neuf at Paris, where much mischief is often done in the night, because of the facility of getting off among the narrow streets in the Isle du Palais.

WE now proceed to the last part of our design, which is, to give an Abstract of the rules of bridge-building, intermixed with remarks, deduced from those rules, on the construction of Westminster bridge.

It appears that bridges are built in so many various manners, with regard to the situation

situation of places, and the materials which men are obliged to use, that no certain direction can be given on that head. In some countries they are of stone, in others of timber, and in others again the piers are of brick, according as they severally afford those materials. One may indeed cross rivers by so many different sorts of bridges, that to enumerate them all would be endless. However, with regard to the construction of such bridges as are most in use, the subsequent rules, extracted from the most eminent writers on that subject, may be observed.

BRIDGES should be always previously designed, that they may be both commodious and well decorated. The piers, or clusters of piers, are to be equal in number, that there may be one large central arch in the middle, where commonly the current is strongest, and vessels, if the river be navigable, must pass. The thickness of the piers is not to be less than a sixth part of the span of the arch, nor more, say some writers, than a fourth. There are some ancient bridges, however, which deviate greatly from this rule. In that of London particularly,

larly the thickness of the piers, without the sterlings, is much above two thirds of the breadth of the arches ; and with the piers, the interrupted space is more than twice as much as is left for the water-way.

PIERS are commonly guarded in front with an angular spur, or sterling, to break the force of the current. This defence is sometimes also turned semi-circularly ; and, in the antient bridges, it is always a right angle ; which has the advantage of being stronger, and more durable than acute ones. The strongest arches are those whose sweep is a whole semi-circle, like those of Westminster.

THE breadth of a bridge, according to Baptista Alberti, ought to be the same as that of the highway which abuts on it : the thickness or breadth of the piers is to be one third of the apertures of the arches ; the sterlings to be one half the breadth of the piers, and to rise above the greatest height to which the water ever mounts.

PALLADIO says, that four things are to be considered in erecting stone bridges,
viz.

viz. the heads, or abutments, which are made at the banks; the piles, or piers, which are fixed in the river; the arches, which these piers support; and the pavement which is made over the arches.

HE observes, that the abutments of these bridges should be made as firm and substantial as possibly can be; because they not only serve to support the weight of the arches, as the other piers do, but they likewise keep the whole bridge together, and the arches from cracking or opening. In this particular, the rule of that great architect has been constantly observed in the bridge at Westminster.

THESE heads are made, therefore, where the banks are of stone, gravel, or at least of solid earth: and as no banks of mere earth is naturally solid enough for this occasion, art must be used to make them firm and strong, and other arches and buttresses must be added to the capital ones, that if the water should happen to destroy the bank, yet the way to the bridge might still be preserved. Here too Palladio seems to have been remember'd in Westminster-bridge.

THAT

THAT master adds, that the piers which are to be made in proportion to the largeness of the river, should always be even in regard to their number, for more than one reason; not only the better to support the weight, but that they should likewise strike the eye agreeably.

FOR the purpose of strength, the piers ought to be so disposed, as to fall in those parts of the river where the course is least rapid. This precept may be better effected in a small river, than in so large a one as the Thames is at Westminster.

THE foundation of bridges ought to be laid at that time of the year when the waters are lowest, which is in Autumn; and in case the bottom of the river be of stone, hard compact gravel, chalk, or any other stony substance whatsoever, the foundations are already prepared, without any trouble of digging, because these are naturally the best foundations: but in case the bottom of the river be of sand, or loose gravel, it must be dug till the workman comes to the solid stratum; or, if that should prove too laborious

rious or impracticable, he must dig moderately deep in the sand or gravel, and then drive in oaken piles, which will reach the solid and firm ground with the iron by which their points are to be armed. This is M. Palladio's doctrine, and may doubtless be pleaded by Mr. Labeledy in support of his judgment against piling, especially on the Westminster side, where the misfortune happened, and where he thought himself secure of a good bottom. But it ought to have been known, whether the hard bottom extended to any considerable depth. Certainly, to lay the foundation of the piers, according to this great master's architecture, only one small part of the bed of the river must be inclosed from the water. The masons must then build there, that the other parts being left open, the water may have its free current; and so to go on from part to part. It is here plain, that the method of building the piers in caissons, was generally unknown in his time, and this method is certainly a great improvement in the art of bridge-building.

THE piers should be made of great stones joined together with cramps, and bars of iron,

iron, and the cramps cemented together with melted lead, that they may be, as it were, all of one piece by such ligaments. Perhaps this rule was never better observed, than in this bridge that occasioned these sheets; especially in regard to the bulk of the stones, most of which, as we have seen, are more than several tons in weight.

THE front of the piers, continues our author, or that side which faces the stream, should be made angular or circular; not only to divide or break the water, but also that those things which are impetuously brought down the river, when they strike against them, may be shoved from the piers, and pass through the middle of the arch. As the tide in the Thames at London, of which Palladio had no idea, has alternately the motion of two contrary streams, and almost the force and weight of a land inundation made twice in every twenty-four hours, it was necessary that a bridge there should be equally guarded on both sides, and guard sufficient to bear the strongest impression that can be made on it. There seems to be no defect, on this account, in the new bridge at Westminster.

THE

THE arches themselves should be made very strong and substantial, and with large stones, well united together, the better to resist the constant weight of carriages passing, or any other load that may accidentally happen to bear upon them ; and those arches, as before observ'd, are the strongest which consist of a semi-circle, because they entirely rest upon the piers, and never press upon each other. That the arches of Westminster-bridge will bear any weight that is likely to be laid on it, no body pretends to doubt : and with regard to any lateral pressure of the arches on each other, the misfortune of the sinking pier demonstrated the words of the architect to be true, tho' scarcely believed by many when they were spoken, viz. that every arch of the structure would stand alone, tho' all the rest were demolish'd on either side.

OUR architect allows, that if, by the nature of the situation, and the disposition of the piers, a perfect semi-circle should not be commodious, as rendering the declivity too great, and the ascent and descent difficult, a lesser segment must be then made use of,

of, and such arches constructed as rise only the third part of a circle diameter ; but in this case, the foundations must be made extremely strong, and so must the abutments be upon the banks.

THE last rule is, that the pavements of bridges ought to be made exactly like those of high-ways and streets; and this is the substance of Palladio's instructions and rules for the building of bridges.

NOTWITHSTANDING all these rules given by that famous master, and other eminent architects, as Alberti, Scammozzi, Goldman, Hawksmoor, and Gautier, complaints are still made that no demonstrative reasons are given for the several proportions of the most essential parts of bridges; much of which is still left to the discretion of the builder, to be regulated according to the circumstances, form, place, magnitude, &c. of the design'd edifice. Thus it appears, that the genius of the architect hath still sufficient scope to exert itself in every capital work of this nature. If Mr. Labeledy has been so happy in this principal characteristic of a master,

ter, he must gain sufficient reputation by the work he has just compleated.

M. GAUTIER wishes that some able mathematicians would take the structure and proportions of bridges into consideration, in order to reduce the subject to more certainty and precision, founded on invariable geometrical truth ; something of which kind has been attempted by M. de la Hire, in the Memoirs of the Royal Academy of Sciences at Paris, Anno 1712, and the Marquis de L'Hopital, in Act. Lips. 1695.

IN fact, there are few bridges, especially those of any note, which do not differ in their proportions and comparative dimensions, and which have not some things remarkable and particular, whereby they are distinguishable from each other. For example, the famous bridge at Venice, called the Rialto (which must so often recur in a work of this nature) consists but of a single flat or low arch, whose span is ninety-five feet, and its height above the water only twenty-four feet. Those of St. Esprit, Avignon, and Lyons, as has been observed, are not streight, especially the

two former, but crooked, having an angle whose convexity is turned towards the stream, to break the force thereof. But as we have already described those bridges, we only just mention these particulars to illustrate this remark on the diversity of forms.

PALLADIO gives the draught of a bridge of his own invention, which was to be built over a very rapid river, one hundred and eighty feet broad. The whole breadth of the bridge is divided into three arches, that of the middle to be sixty feet broad, and the other two forty-eight each. The piers for the support of the arches were twelve feet thick, which rendered them a fifth part of the middle arch, and a fourth part of the lesser ones. The piers were made so thick, on purpose that they might have strength to project very far from the body of the bridge, in order to resist the rapidity of the current, and the force of the stones and trees borne down against it by the violence of the stream. The arches were to have been a segment of a circle less than the half, that the ascent and descent of the bridge might be plain and easy. The crown of the arches was to have been equal in thickness to a
seven-

seventeenth part of the void of the middle arch, and to a fourteenth part of the other two. Over the piers were to have been niches, and statues, and a cornice, on both sides, the whole length of the bridge.

WITH regard to bridges that are built of wood, and consist of beams and joists, sustained by piles, or punchions, well cramped and bound together, we should not have touched on the general description of them, if it had not been on account of the curious one lately erected at Walton: but as this seems, in some respects, to excel all that is said of the wooden bridges described by artists, we will insert a short extract of what has been written on this subject*.

THE antient Romans called this sort of bridges, *pontes sublicii*; on the structure of which Sturmius has an express dissertation.

PALLADIO pretends, that the particulars for the erection of wooden bridges being innumerable, no certain or determinate

* See a profile of Walton-bridge in *Gent. Magazine* 1748, and of other wooden bridges in Nov. last.

rules can be prescribed concerning them : however, he gives draughts of several bridges of that kind ; and, after particularizing their respective proportions, is of opinion, that an architect who has the least genius, may from thence take his measures for the building of wooden bridges.

AMONG his several draughts, he proposes that of the wooden bridge built over the Cismone, a river which falls from the mountains that divide Italy from Germany, and enters into the Buena a little above Bassano, as the most substantial, beautiful, and commodious, within his knowledge. The river over which this bridge extends, is an hundred feet broad, which breadth is divided into six equal parts. The banks are strengthened with two solid abutments of stone, and betwixt the divisions are placed the five ranges of piles which constitute the support, and limit the breadth of the bridge. Over these are placed sommers, or main beams, which extend lengthways a-cross the water ; and the cross joists, which form the breadth of the bridge, are fastened to these beams with iron cramps, which pass thro' holes at the extremity of each of them, where

where they advance beyond the lateral beams. These cramps being perforated in divers places, and particularly in the lower part of them, are fastened to the lateral beams, and to the piles below, with iron pins made proper for that purpose.

HENCE, as he observes, the whole work becomes, as it were, united; so that the transverse joists, which make the breadth of the bridge, and the beams which form the sides, are, in a manner, one piece with the piles. The piles support the cross joists, as well as the beams that extend lengthways, and which again support the said joists. Thus all the parts mutually support each other, and their disposition is such, that the greater weight there is on the bridge, so much the faster do they press together, and corroborate the work. All those beams and joists, which constitute the body of the bridge, are but a foot each in breadth, and nine inches in thickness.

THIS description, which we have made as intelligible as we could, we leave the curious reader to compare with that of the wooden bridge at Walton, and with his
own

own observations on the latter. It is immediately obvious how much the English bridge must have the advantage in many respects, particularly in the capacity of the arches, though the other was the most perfect structure of its kind that was known to Palladio.

BUT from the whole of this historical account of bridges, we apprehend it appears to every intelligent person, that if we consider its length, its breadth, the regularity of the design, the beauty of the workmanship, the manner in which it was constructed, the breadth and depth of the river it extends over, the quantity of water that passes through it without sensible obstruction, the great inland navigation which it does not impede, the spaciousness and commodiousness of the carriage and footways over it, the easy ascent it affords, the avenues that lead to it, the provision made for the defence of passengers against the weather in their way over it, the watch for the security of their persons, and the beautiful globular lights, suspended on irons that project inwards, with a lofty sweep, from the top of each recess, and on the sides of the

the abutments (with other political additions ;) all these things, and many more that might be enumerated, being well considered, we apprehend, that no bridge which we have described or mentioned, or that is described or mentioned in history, can equal that of Westminster in the greatest number of estimable particulars and circumstances; tho' possibly some of them may surpass it in one or two that might happen rather from nature and accident, than from art and contrivance. We shall therefore venture to conclude with a short sketch of poetry, which a friend who deals in that way, and knew we were on this subject, voluntarily composed for us while the foregoing sheets were at the press :

ON

WESTMINSTER BRIDGE.

WHEN late the river-gods would visit
Thames,

Rhine, Danube, Tagus, Seine, and other names ;
 Allur'd by fame, who told what fleets he bore,
 What wealth, what splendor dignify'd his
 shore :

As from the sea, high surging on his tide,
 Thro' woods of ships they with amazement
 ride,

Still new delights the varying scenes disclose,
 Till, interceptive, the first bridge arose.

‘ Is That, they ask, the work of human skill ?
 ‘ Or springs the river from yon peopled hill ?’

THIS doubt, by slow approach, is solv'd at
 last,

And the press'd arches they with trembling pass.
 Now mingling spires, and *Paul's* stupendous
 dome

Attract their eyes, as westward on they roam ;
 Till winding to the left, as leads the flood,
 Sprung the last wonder, and before them stood.

ASTO-

ASTONISH'D! ravish'd! 'no confusion's here;
 'Th' uncumber'd structure swells distinct and
 clear,
 'They cry'd. — But whence? how rais'd? O
 Thames, impart!
 'Wrought all thy sons by learned *Ifis*' art?
 'Wey, Kennet, Wandle, Mole, and Cole, and Lee;
 'Their beds relinquish'd, labour'd they for
 thee?
 'Or say, if from the deep, to succour those,
 '(His fav'rite Thou) our common father rose?
 'He, antient architect, with *Phæbus* toil'd
 'On *Ilion*'s walls, which long the *Grecians*
 foil'd:
 'And he, or *Phæbus*, or the blue-ey'd maid,
 'Must plan this bridge, and lend the workmen
 aid.
 'Like this, no pile did e'er our streams bestride,
 'Tho' crowded towns rise thick on either side;
 'Tho', thine except, thro' fert'lest plains they
 stray,
 'And wash more spacious kingdoms in their
 way.'

APPENDIX.

Abstracts of several Acts of Parliament relating to the new Bridge at Westminster.

Stat. 9, Geo. II. cap. 29.

SECT. I. **T**HE arch-bishop of Canterbury, the lord high chancellor, and others, are appointed commissioners for building a bridge a-cross the Thames from New-palace-yard, and for supporting the same.

SECT. II. The commissioners, or any nine of them, shall meet and adjourn themselves; and if there shall not appear at any meeting a sufficient number to act, the clerk of the commissions shall, by notice in the London Gazette ten days before the next meeting, appoint the commissioners to meet at the place where the meeting was appointed, within fifteen days after the day on which

which such last meeting was appointed ; and the commissioners shall pay their own charges.

SECT. III. It shall be lawful for the commissioners to design how the said bridge shall be built, and the ways to the same, and to keep in repair such ways, and to make contracts for effecting the purposes aforesaid.

SECT. IV. There shall remain a passage for the water through the arches of 760 feet ; and it shall not be lawful for the commissioners to suffer to be erected any houses upon the bridge.

SECT. V. If any persons shall wilfully and maliciously destroy the bridge, or any part thereof, or attempt so to do, or unlawfully remove any works thereto belonging, whereby the bridge may be damaged, such offenders shall be guilty of felony, without benefit of clergy.

SECT. VI. All materials which shall be made use of for the bridge, or for making
the

the river deeper, shall be deemed the property of the commissioners.

SECT. VII. The commissioners shall have power to agree with the owners of ground or houses, and, upon payment of such money so agreed upon, are authorized to pull the houses down, or cause the owners to build accordingly, &c.

SECT. VIII. It shall be lawful for all bodies politic, executors, guardians, or trustees, on behalf of infants, *femes covert*, or other *cestui que trusts*, and for all other persons, to sell to the commissioners such houses and ground for the purposes aforesaid; and if any person shall refuse to agree, it shall be lawful for the commissioners to issue out warrants to the high bailiff of Westminster, or to the sheriff of Surrey, to return a good jury before the commissioners, to assess damage to the owners and occupiers of such houses or ground, and the payment or tender of the money so awarded, shall be binding against the parties.

SECT. IX. All sums of money to be paid pursuant to such determination, are charged
upon

upon all money which shall be raised for the purposes of this act.

SECT. X. The commissioners shall, before the bridge shall be made passable, settle the recompence to be made to the lord arch-bishop of Canterbury and his censors, and all other persons having interest, in the horse-ferry from Westminster to Lambeth; and also to the poor watermen of St. Margaret's and St. John the evangelist in Westminster, for the Sunday's ferry: and, in case such recompence cannot be settled by agreement, the commissioners shall assess the same by a jury of Middlesex.

SECT. XI. The recompence to be made for the interest of the lord arch-bishop of Canterbury in the horse-ferry shall be paid to the arch-bishop, to be laid out in the purchase of lands, to be conveyed to the said arch-bishop and his successors; and, until such purchase, the money shall be placed out by the arch-bishop in the public funds. And as to the recompence in respect of the interest of the poor watermen of St. Margaret's and St. John the evangelist in Westminster, in the Sunday's ferry, the
money

money shall be paid to the overseers and rulers, auditors and assistants, of the society of watermen, lightermen, &c. upon the river of Thames, between Gravesend and Windfor, to be laid out in the funds, and the yearly produce to be distributed amongst such poor decayed watermen, and their widows, of the said parishes, as shall be thought proper by the said overseers, &c.

SECT. XII. The commissioners are empowered to examine witnesses, and to use all other lawful ways for information; and in default of a sufficient number of jurymen, the high bailiff or sheriff of Surrey shall return other men of the standers by, to the number of twenty-four, and all persons shall have lawful challenges; and the commissioners shall have power to impose any reasonable fine on such high bailiff or sheriff making default, and on any persons summoned on juries, and to levy such fines by warrants of distress and sale of goods; and such fines shall be applied to the use of the poor watermen, and their widows, of the parish of St. Margaret and St. John the evangelist, as is directed by an act 11 and 12 Will. III. cap. 21.

SECT.

SECT. XIII. Artificers and others, who shall make any contract with the commissioners, shall give security for performance.

SECT. XIV. It shall be lawful for the commissioners by writing to appoint such treasurer, clerks, and other officers as they shall think fit, which shall be removeable at the will of the commissioners by writing; and the commissioners may make such allowances unto such treasurer, clerks and officers, as they shall think reasonable; and the treasurer, clerk and officers, shall upon oath if required, give a true account of all moneys which they shall have received and disbursed.

SECT. XV. There shall be kept by the treasurer books, in which all moneys received by him, and payments out of the same, shall be entered; and four times in every year the account shall be drawn out, signed by the treasurer, and delivered to the commissioners; and the accounts, together with copies of all contracts shall be delivered to each house of parliament within fourteen days after the opening of every session.

SECT.

SECT. XVI. No commissioner shall be capable of acting, during such time as he shall have any office under the authority of this act, or any interest in any contract.

SECT. XVII. It shall be lawful for the commissioners to remove shelves or sand in the Thames, to make the river deeper.

SECT. XVIII. When any of the commissioners shall die, or refuse to act, the remaining commissioners shall by writing elect more; notice being first given in the Gazette ten days before.

SECT. XIX. Nothing in this act shall prejudice any right of the mayor or city of London, upon the Thames, except to remove shelves, or to deepen or widen the river near the bridge, and for the erecting and supporting the bridge.

SECT. XX. The bridge shall not be rated for the land-tax, high-ways, poor's rate, church wardens, or any other parish rate, but be extraparochial.

SECT.

SECT. XXI. The bridge shall not be a county bridge.

SECT. XXII. Any action brought for any thing done in relation to the premises, shall be brought within six months after the fact, and shall be laid in Middlesex, and the defendant may plead the general issue; and if judgment be against the plaintiff, the defendant shall have treble costs.

SECT. XXIII. This act is a public act.

Stat. 10 Geo. 2. cap. 16. sect. 28.

SECT. XLIII. The commissioners or the corporation are impowered, as soon as the bridge shall be passable, to settle the recompence to be made to the company of watermen, for their interest in the Sunday ferries; and in case such recompence cannot be settled by agreement, the commissioners or corporation are required within two calendar months after the expiration of one year, to be computed from the day the bridge shall be made passable, to proceed to assess the same by a jury in the county
S of

of Surrey, in the same manner as the commissioners or corporation are impowered to assess damages for houses or ground to be purchased ; and the commissioners or corporation are to cause such recompence to be paid to the rulers of the company of watermen, within one kalendar month after such judgment obtained ; which money shall be laid out in the public funds, and the yearly produce thereof shall be applied to the same purposes as the money arising by such ferries hath been.

THE greatest part of this act relates to the incorporation of the commissioners, and impowering them to lay a toll for the passage of the bridge, in case the money first granted by parliament was not sufficient to build it ; which toll, or pontage, it also settles, and appropriates to the several purposes of the bridge. But as the legislature afterwards thought proper to compleat the whole work out of the annual supplies, and leave the passage entirely free, those parts of this act were abrogated or superseded by subsequent laws.

SECT.

Stat. 11 Geo. 2. cap. 25. sect. 4.

SECT. I. The intended bridge shall be laid from the Wooll-staple, or thereabouts in Westminster.

SECT. III. The commissioners may lend the money at the receipt of his majesty's exchequer, upon the credit of the land-tax, or duties upon malt, granted in this session, or upon any other public security.

SECT. IV. It shall be lawful for the commissioners to sell or dispose of ground not necessary for widening the streets, and to lay out in what manner the new houses to be built thereupon shall be erected, and of what extent the streets shall be.

SECT. V. The moneys arising by the sale or letting of such grounds, and selling the materials of the houses to be pulled down, shall be employed towards building the bridge and repairing the same, or to paving, lighting, and watching the bridge.

SECT.

SECT. VI. The commissioners shall deliver into each house of parliament, once every year, within twenty days after the opening of the session; a true account of their proceedings.

SECT. VIII. This act shall be a public act.

What extent the forest shall be
be built thereupon shall be erected, and of
lay out in what manner the new houses to
necessary for widening the forest, and to
numbers to take on the site of ground not
Sect. IV. It shall be lawful for the com-

lighting, and watching the bridge, shall be employed towards building the materials of the houses to be pulled down, or letting of such grounds, and letting the

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